METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

APRIL, 1947 VOL 45 • NUMBER 4

Founded as Metal Industry, January, 1903
by Palmer H. Langdon, 1868-1935

Published Monthly by

METAL INDUSTRY PUBLISHING CO., INC.
11 West 42nd St. New York 18, N. Y.
Telephone: PEnnsylvania 6-0226

also publishers of
Organic Finishing, monthly, $1.00 per year
Guidebook-Directory for the Metal Finishing Industries, annually, $1.50

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Electroplating of aluminum on metallic columns which were used in the City Hall in Philadelphia at its construction in 1892.

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Barrel plating of small parts for uniformity of coating and ease in handling as done by a prominent manufacturer of toy trains.

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ESTABLISHED 1903

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COOPERATION

Some of the most important events these days are controversies over so-called labor-management problems. Such problems should not exist, for labor and management are synonymous. Labor without management is senseless; similarly, management without labor meaningless. In proper perspective, the entire labor-management scene is a scramble between blood brothers, for no other means of effort are more closely related.

"Management" is considered by "labor" as being the Iron Fist which Wrenches Bread from Starving Mouths—it is remarkable the varied forms the Ogre takes. But who or what is management? Using the popular definition of labor as being the productive worker, management is really composed of people in supervisory positions: whether it be the foreman, the superintendent, the manager or the president, all are supervisors and all are LABOR. They are as much a part of labor as the productive worker, for it is with their know-how, their cooperation and their ability to organize and inspire that the productive worker finds ore to make steel, steel to fabricate parts, parts to finish units and units to market for consumers.

In the overall picture, there can be no basic differences between these individuals with common interests. The supervisor is a paid employee like the operator on the floor; his interest is to get the work out the back door cheaper, faster and better than his competitor—this is certainly the fundamental concern of the operator as well. The supervisor has controlled power to hire or fire, and he has limited control over his fellow production worker's job if business is bad; the control is exercised by the productive worker himself. Supervision's job consists of know-how, persuasion, inspiration, cooperation. The Ogre is not "management": it is competition, the very life-blood of Democracy. Competition gives more of superior quality for less: it creates jobs for all by opening new fields and enlarging old ones; its essential reaction is to weld groups engaged in a single endeavor into a solid unit. Capital is merely a tool of competition, for where goes the demand, there goes the enterprising money. Materials are products of effort, both supervisory and productive. Hence, the entire cycle of industry depends upon the only variable involved: cooperation.

In the final essence, the sooner we realize our quarrel is with competition and not ourselves, the sooner our efforts will develop into a broader life.

Metallography for the Electroplater

By Alex Blazy[1] and J. B. Mohler[2]

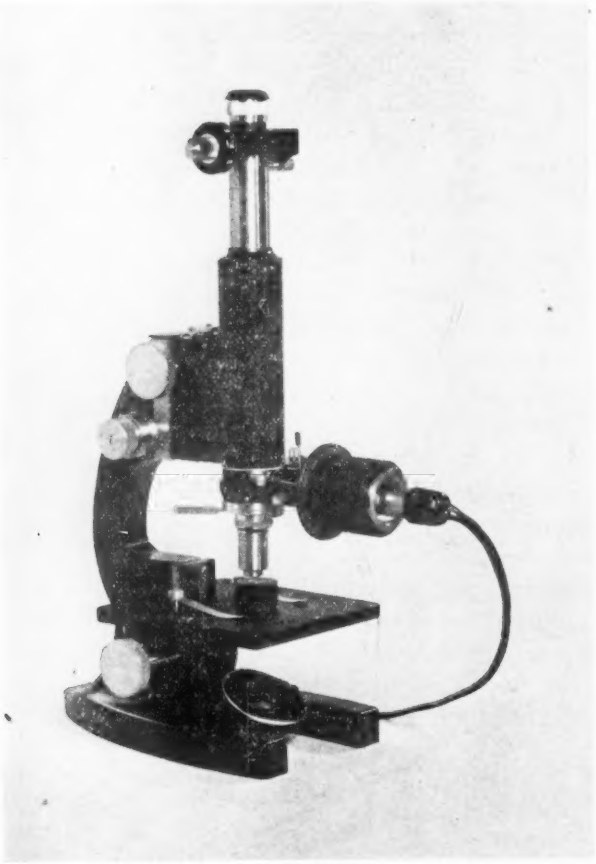
Techniques in metallography for the examination of electroplated coatings are described. The equipment necessary for this type of work is investigated in some detail and an explanation of microscopic methods of interpreting electrodeposited coatings is given. A valuable series of tables list the necessary etching reagents for the common metals and alloys together with directions for their use.—Ed.

QUALITY plating can only be produced by continual testing and inspection to find the inferior pieces that occasionally occur in the best controlled process. When defective work is found it must be scrapped or salvaged; but the nature of the defect often suggests means for lowering the percentage of rejects. Many rejects are found by two types of visual examination, namely:

1. With the unaided eye.
2. With the aid of a microscope.

Pieces may be rejected on the basis that they are rough, pitted or blistered providing these defects can be seen. Often such imperfections are present but can only be seen under the microscope and if this occurs, microscopic examination will warn of potential trouble for if the defects become larger it may be cause for rejection.

[1] Metallographer, The Cleveland Graphite Bronze Co.
[2] Research Chemist, The Cleveland Graphite Bronze Co.



(Courtesy Bausch and Lomb Optical Co.)

Figure 1. Metallurgical microscope with Filar Micrometer Eyepiece for high power examination and measurement of plate thickness.

The metallographer is a master in the examination of metals particularly in microscopic examination, so that it is worth while to be conscious of the tools he uses. In fact, many plating problems have been solved under the metallurgical microscope.

By magnification of a plated surface one can see things that cannot be seen by the unaided eye, such as tiny blisters, nodules, holes, cracks, and other faults in the deposit. By examination of a section of a deposit other things can be learned, such as local thickness in a recess, structure of the deposit, or lack of adhesion.

Types of Microscopes

There are two types of microscopes that are used for examination of metals: low-power and high-power instruments. The low-power microscope is generally used for the examination of surfaces and the high-power microscope for the examination of structures.

The low-power microscopes may be classified as single-objective and double-objective, this latter instrument being known as the stereoscopic microscope.

The high-power microscopes used for examination of metals are known as metallurgical microscopes; they may also be placed in two classes: The metallurgical microscope, and the bench-type metallurgical microscope.

The bench-type metallurgical microscope is a complex piece of equipment; it is provided with a camera to photographically record features of the specimen. Because of this convenience it is the standard equip-

ment used to make photomicrographs. Photographic records and good visual examination are made possible because a strong light source is used to introduce light into the optical system; by means of prisms the light is directed so that it will illuminate the specimen. From the specimen, the light is reflected back into the system and to the eyepiece.

If a great deal of metallographic work is to be done the bench-type metallurgical microscope will be required. However, this type of instrument is for a trained metallographer and it is not intended that our remarks cover the skill of such a technician.

If high power examination is essential then a metallurgical microscope as shown in Figure 1 may be used. This instrument, which is a simple form of the bench-type metallurgical microscope, is similar to the biological microscope. It differs from the biological microscope in that a place is provided in the barrel for introducing the required amount of light to illuminate the surface of the specimen.

The high power microscopes are used for examination at magnifications from 50X to 400X where the specimen is prepared for examination by polishing and etching.

High power is not essential for all microscopic examination. It is true, that high magnification is often required but it is just as true that details may be lost by the use of too high a power. Things may often be seen at 10 power that reveal the cause for a rough surface where these same troubles may be lost at greater than 40 power; a low power microscope is an aid to any plating shop, even if it is only an inexpensive pocket type 20X instrument. However, if many examinations are to be made it is convenient to have a stereoscopic microscope. This device is easy on the eyes and the double-objectives and two eyepieces introduce a third-dimensional effect. The instrument is used for examination from 10X to 140X and may even be used for examination of structures at the higher powers.

The stereoscopic microscope and a recommended lighting arrangement are shown in Figure 2. Because of the rugged construction of the stereoscopic microscope it is easily transportable to the job. In construction, this instrument is really an arrangement of two microscopes, one for each eye, mounted in one body. The alignment of the eyepieces and the paired objectives is such as to incline one toward the other and thus center the convergent views on one focal point; in this way the stereoscopic effect of depth is obtained. In practice, one pair of eyepieces and two or three sets of paired objectives are sufficient to cover the low-power range.

Special lamps may be purchased for illuminating the field of the stereoscopic microscope, but efficient and simple lighting can be obtained by the use of an ordinary fluorescent desk lamp. The light source of this hooded lamp is fixed close to the objective nosepiece and above the specimen as shown in Figure 3. By virtue of the special quality of fluorescent illumination, a soft diffuse light is the result. The intensity, moreover, is enough for the highest magnification. A lamp having two fluorescent tubes is best, but where desirable, the lighting may be daylight or white fluorescent or a combination of both.

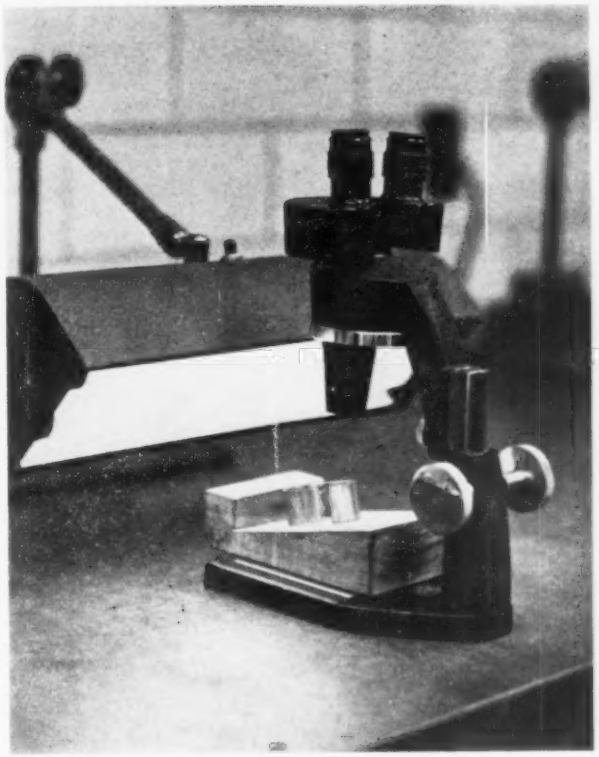


Figure 2. Stereoscopic microscope with lighting arrangement for wide field examination.

The stereoscopic microscope can be made to perform as a first class microscope within the limits of its magnification. It may be used for surface examination and in many cases it may be used to examine specimens prepared metallographically. All that need be done is to build a small inclined platform as a rest for specimens. This is placed on the stage directly under the objective, and by moving the microscope and stage holding the inclined block and the specimen, the most favorable position for lighting may be found.

By use of the inclined block the full field is not in focus at higher powers, only the plane along the line of focus; yet easy working of the coarse adjustment makes study of the whole field possible.

Low Power Examination

Examination at low power will often reveal poor quality plating. Ten power is often sufficient and very rarely is a higher power than 50 required since faults that cannot be revealed at 50 power are usually insignificant.

Under low power magnification small raised areas may often be observed in the plate. By use of a needle, a small knife blade, or a probe it may be determined if these raised areas are blisters or nodules. If they are blisters they may be pushed flat or they may be punctured; if they are nodules they will be solid and will be more difficult to cut or deform with a small instrument. Nodules may indicate dirt or impurities in the plating process whereas blisters in-

dicate any of the troubles that lead to poor adhesion. If blisters are present it may mean poor adhesion or it may only mean lack of bond beneath the blister. This can often be determined by trying to lift the plate next to the blister, which may be done if adhesion is poor; if the plate cannot be loosened then only the blistered area may be bad. Troubles that produce blisters, such as porous basis metal, are then indicated, whereas, if adhesion is poor then improper treatment previous to plating is a likely cause. Probing is most successful with soft deposits of about one mil thickness. Where the deposits lend themselves to such a means of testing, the probe may even be used for a bond check. By the use of the low power microscope and a sharp probe many interesting facts can be uncovered. The above examples show how a little study will indicate the cause of plating troubles.

If a heavy deposit is available it may be sectioned: the section may be polished and such a prepared specimen may be examined in cross section. By such examination porosity and inclusions in the plate may be found. Figure 4 shows a polished section of heavy silver plate revealing small pores. After the polished specimen is examined it is an easy matter to etch it and examine the structure; such examinations may be made at 50 to 100X but often it is desirable to use higher power.

Preparation of the Specimen

If an examination is to be made in cross section for structure, considerable care is required during preparation of the specimen.

The preparatory steps consist of:

A. Cutting the specimen from the sample piece.

B. Mounting the specimen so that it may be held during polishing.

C. Rough smoothing with a file.

D. Polishing with a series of papers and finally a cloth to give a more smooth surface in each step.

E. Etching.

Most plated material is thin or at least the deposit

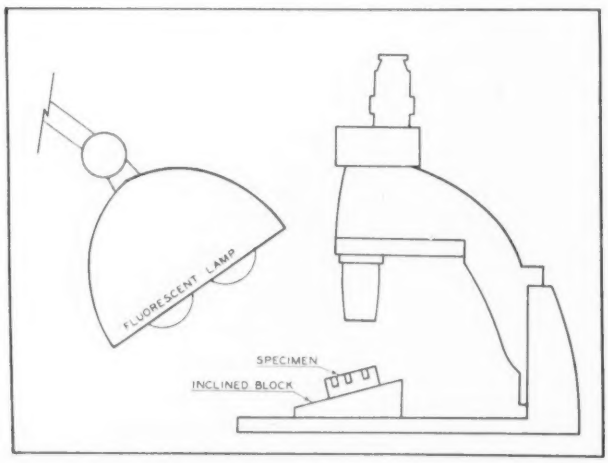


Figure 3. Diagram of lighting arrangement with a fluorescent desk lamp for use with the stereoscopic microscope.

Figure 4. Polished section of heavy silver plate showing pores in the deposited metal (white). 100x.

is thin so that the usual metallographic procedure has to be modified to take this into account, hence particular care has to be exercised so that the edge will not be rounded during the preparatory steps. Another factor also makes it necessary to take special care; this is that two metals are involved, the deposit and the basis metal. Each metal will respond differently to the preparatory steps.

When thin specimens are to be examined they must be mounted in a suitable material so that the edge can be properly prepared. The specimen may be mounted in a plastic; either Lucite or Bakelite. The plastic is available in the form of powders and by the use of a mounting press the mount can be made.

The plastic mount is formed by the use of heat and pressure. The specimen is held in position, plastic powder is poured around it, the whole is heated and pressure is applied. Plastic mounting equipment is convenient but not essential. Pieces can be cut to uniform size with a hack saw, drilled and held together with a stove bolt as shown in Figure 5.

In any method of mounting it is best to mount a number of specimens since a number may be prepared for examination just as easily as one. The form of the mount should be kept low so that it does not have a tendency to twist during the polishing steps.

The mount containing the specimen or a number of specimens is filed as the first step to produce a smooth surface; this is best accomplished by draw filing. The file is clamped in a vice and the mount pushed across

it so that the basis metal is cut first. The file should be kept clean to prevent particles from being embedded in the specimen; in fact, cleanliness must be practiced in all of the steps for the same reason.

After filing, the specimen is polished on a series of papers, each with a finer grit. On each paper the specimen is pushed across the abrasive surface in single strokes until the scratches from the preceding step have disappeared. In the next step the specimen is turned 90 degrees and the scratch removing process repeated; the mount should be pushed across the paper, lifted, pushed across the paper, lifted, etc.—it should not be rubbed back and forth. The series of papers usually consist of 320, 0, 00 and 000 grit in succession and care should be taken that the metal does not heat and flow. The whole process has much in common with buffing and polishing used to produce a bright smooth surface on plated articles, but the effort is to produce a flat surface and not to flow the metal, contrary to ordinary buffing and polishing practice.

After the surface is prepared on the series of papers it must be polished on a cloth. The type of cloth

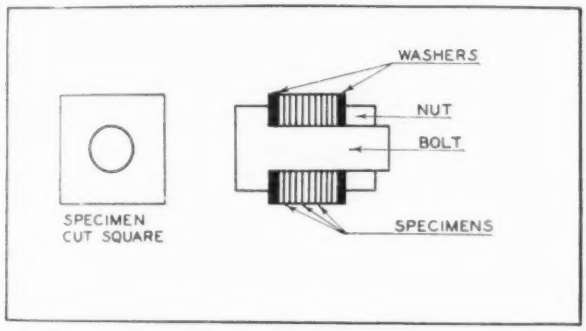


Figure 5. Mechanical method of mounting specimens.

selected and the means of holding the abrasive in the cloth may be accomplished in a number of ways. A cloth may be tacked to a board and impregnated with abrasive as shown in Figure 6, or a cloth may be attached to a power driven flat wheel. The specimen can be polished by holding it against the properly prepared rotating wheel. In this polishing step there is

Figure 6. Polishing with levigated alumina on a flat cloth.

(Courtesy Buehler, Ltd.).

Figure 7. Machine for electrolytic polishing of specimens.

some slight flowing of the metal surface. This flowed or worked metal surface is later removed by etching.

In the whole process the specimen is brought to a high polish. It may then be etched in a suitable etchant to reveal the structure.

For some metals or alloys electrolytic polishing methods are used. An electrolytic set-up may be made for this purpose or a commercial machine may be obtained; such a machine is shown in Figure 7.

Examination

Examination of the specimen depends on what is being sought. If the interest is in cracks, porosity or inclusions then it is best to examine the specimen in the unetched state. If the interest is in structure then this is revealed by the etch. It is sometimes necessary to polish and etch, and then polish and etch several times more to be sure that the worked surface is removed, that a proper undistorted structure is revealed, and that the specimen is not over-etched or under-etched.

If the bond line is to be examined, great care and patience is required in the entire process. Some of our best metallographers have had trouble with the complex problem of properly preparing specimens for examination of a bond line. One metal will be softer than the other and is thus liable to be removed faster; producing a taper at the bond line. In addition, each metal will react differently to the etch.

(To be concluded next month)

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Rectifiers for Electroplating—Part II

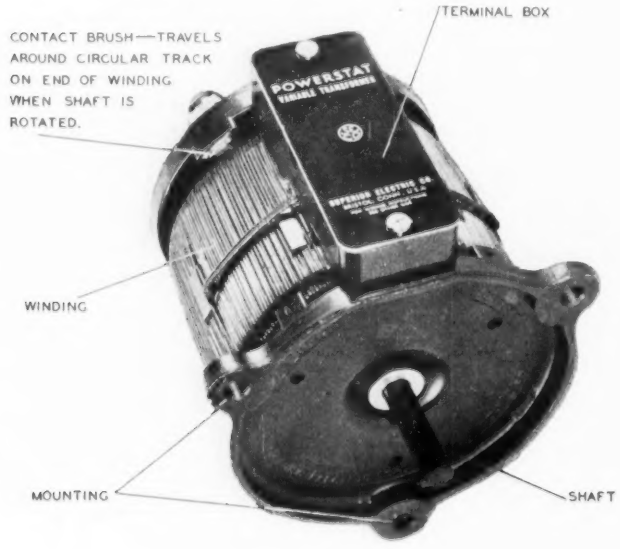
By Louis W. Reinken, *Chief Engineer, W. Green Electric Co.*

Continuously Variable Auto-transformer Control

AT THE end of the first article in this series we briefly discussed and illustrated single phase and three phase voltage control systems using tapped auto-transformers and selector switches.

It is possible to substitute for the tapped transformer and switches a "continuously variable auto-transformer" which, in effect combines a transformer winding and contact switch in one device, and furthermore provides many more taps so that the control is practically stepless from zero to maximum. Moreover, the construction is such that momentary interruption of the current is not necessary when changing voltage, and the control is therefore continuous as well as stepless.

The photograph, Fig. 10, shows a small single phase unit of this type which has been selected to show the general construction clearly. The iron core of this transformer instead of being one of the usual square or rectangular shapes, is in the form of a ring, and most of the core is covered by the "toroidal" winding. The upper end of the winding (not visible in the photograph) has a ground and polished track, and over this track travels a spring-loaded graphite contact brush. The brush may be moved to any portion of the track by rotating the shaft, and by this means any voltage from zero to maximum may be obtained with smooth, single-knob, control.



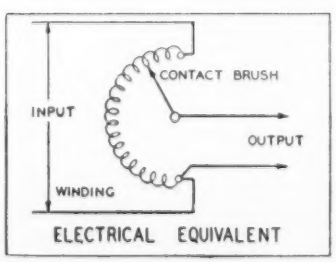


FIG. 10

Other photographs, Figs. 11 and 12, show assemblies of two and three sections arranged for simultaneous rotation by a common knob. These are used in three phase voltage control circuits as shown schematically in Figs. 13A and 13B.

For lower three phase voltages, 110-260 volts, either the open delta or the star circuit may be used, but for higher voltages such as 440 or 550 volts, the star circuit is preferable. It will be noted that if the star circuit is used for 440 volts the potential across each arm of the star is only 254 volts (440 volts divided by the square root of 3), whereas if the open delta circuit were used, the voltage across each of the two arms would be 440 volts.

Variable auto-transformers are generally designed to provide a range from zero up to a maximum of about 15% above the AC supply voltage, for instance 0-270 volts output from a supply of 230 volts. The primary windings of the stepdown transformer must, of course, be designed to match this voltage range. Since three leads appear from the output side of the variable auto-transformer (instead of the six leads characteristic of the tapped transformer and switch arrangement discussed in Part I) the primaries of the stepdown transformer may be connected in any standard arrangement such as delta or star.

In addition to providing continuously variable output from zero to maximum for voltage control purposes, these transformers may be equipped also with one or more fixed voltage taps to supply voltage for auxiliary equipment, such as fans or timing devices, which are generally designed for 110 or 220 volt operation.

Motor-driven Variable Auto-Transformers

Variable transformers are available also with a reversible motor drive substituted for the manual knob control. A large three phase unit equipped with such

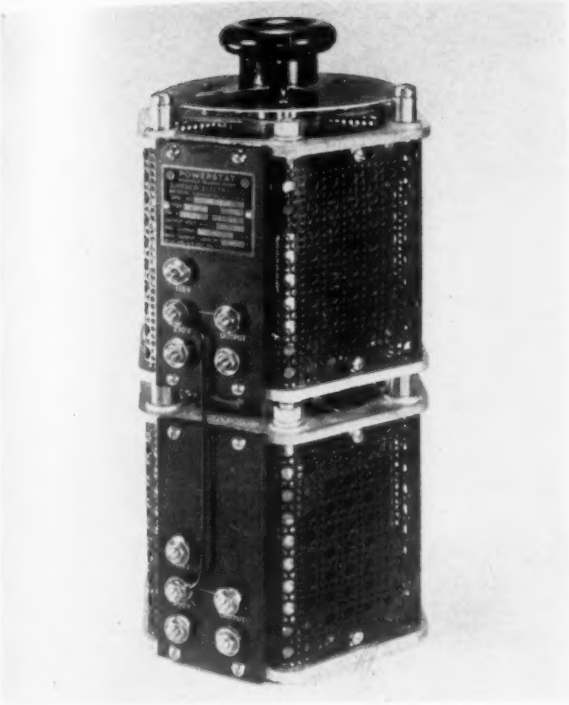


Fig. 11.

a drive is shown in Fig. 14. In this arrangement the shaft is driven through a gear train by a small reversible motor, the total time of rotation for complete coverage from zero to maximum varying between 6 seconds and 45 seconds, depending upon the specifications.

The motors are of the split phase type and are designed to decelerate rapidly to prevent "coasting" beyond the desired voltage setting. A simple three wire circuit provides complete remote control, with push buttons or a key switch, of the motor operation.

Many possibilities are opened up by this motor drive among which may be listed:

Remote control of tank voltage and current.

Simultaneous control of several rectifiers in parallel or series.

Automatic control, correlated with other factors affecting plating (for instance time of immersion or speed of travel in continuous processes).

Automatic stabilization of tank voltage.

Automatic stabilization of tank current.

In later articles in this series we will discuss some of the special control arrangements listed above, including a description of a 20,000 ampere bank of rectifier units which is completely supervised and operated by a compact remote control unit incorporating provision for automatic stabilization of voltage or current at will.

Before leaving the subject of variable auto-transformers we would like to summarize, briefly, the advantages and disadvantages of these devices as voltage controls for rectifier equipment.

Advantages

The two major advantages have already been pointed out:

(1) Smooth, continuous, control from zero to maximum.

(2) Available with motor drive for remote or automatic control.

The first of these advantages makes the control ideal for laboratory work, and it may be noted that most of the small single phase rectifier units placed on the market since VJ day have adopted this type of control.

Disadvantages

The major disadvantages, or more properly limitations, may be listed as follows:

(1) Possibility of corrosion.

(2) Stock sizes and limited capacity.

(3) Cost, compared to tapped transformer and switches.

As previously explained, the construction of the variable auto-transformer requires the presence of an exposed copper track on the winding so that the contact brush may make electrical contact of any point along the winding. In view of the notoriously severe conditions in plating rooms this immediately raises the question as to whether or not this track may corrode, and ultimately cause poor contact, or even complete failure of the transformer.

In fairness to this type of transformer it should be recorded that a variety of types and makes have been used by the writer's firm in rectifier units during the past six years and very few failures have occurred, none of which were due to corrosion. However, in each case, it was previously ascertained that local conditions were better than average, or that the unit incorporating the variable transformer was to be located outside of the plating room, or provided with external air.

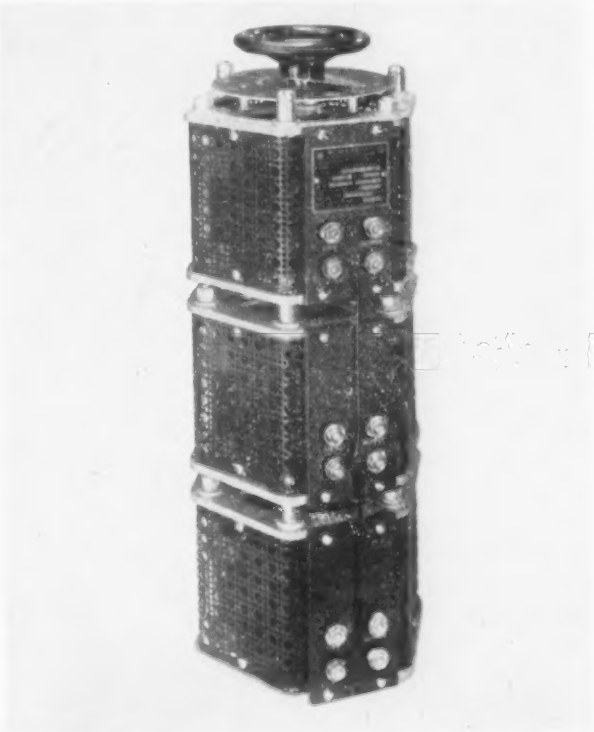


Fig. 12.

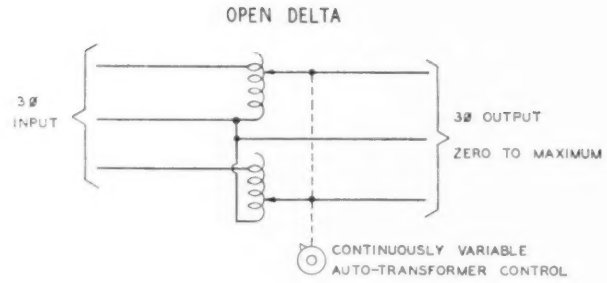


FIG. 13A

Oil Cooling

It has been suggested that variable transformers or similar units may be immersed in oil to eliminate corrosion from the air and also to permit *overloading* beyond its normal air cooled rating. This, however, brings up other problems, the first of which is the oil. Chlorinated non-inflammable oils may not be used, since these are generally corrosive. If natural oils are used then the question of fire protection must be considered, and in some states local regulations require the provision of a fire wall around the oil container and a sump under the oil tank of sufficient capacity to retain all the oil if a leak should develop.

In oil cooling there are the factors of increased weight and cost of oil and oil container, but these are offset by the extent to which the transformer may be operated above its air-cooled rating.

At least one rectifier manufacturer is featuring oil-immersed variable transformers and further experience may provide definite answers to these questions.

Control transformers of this type use fairly complicated core structures and brush contact devices, so that the manufacturers of such transformers have naturally standardized on a comparatively few stock sizes and cannot economically provide custombuilt units to match any supply voltage and to handle any specified wattage.

For example, one typical catalog of standard three phase control transformers lists a choice of only nine units for 230 volts, and only three units for 440 volts. Circuit modifications and slight wiring changes permit the use of these three 440 volt units also on 550 volts.

The largest of the 230 volt units is rated at about 18 KVA and the largest of the 440 volt units at 25 KVA. Incidentally, both of these units utilize the same frame size and are equal in cost, which penalizes the 230 volt customer.

The cost of a variable auto-transformer is usually greater than the material cost of a tapped transformer of normal construction and the associated selector switches. However, this additional cost may be considerably offset by the reduction in wiring labor and the ease of installation of the variable transformer. Provided the required electrical capacity matches that of a standard variable transformer, the use of this device is generally economically justified in view of the increased ease of voltage control. Particularly in laboratory units, such as the three-phase unit shown in Fig. 15, variable auto-transformer control is highly desirable.

Rectifier Construction—Ventilation

At the present time three types of metal plate rectifier elements are used in electroplating rectifiers—magnesium copper sulphide, copper oxide and selenium. There seems to be a trend toward the use of the selenium type rectifier since the number of manufacturers now offering selenium rectifier units far outweigh those manufacturing other types.

Whatever type of metal plate element is used there are two limitations which determine how much electrical power can be handled by the element. These limitations are:

1. The magnitude of the voltage appearing across the plates in the reverse direction.
2. The temperture of the plates themselves.

In Part I of this series it was explained that the fundamental property which distinguishes a rectifier from an ordinary metallic conductor is its ability to permit current to flow readily in one direction and to offer a high resistance to the flow of current in the reverse direction. When impeding reverse current flow, a voltage is developed across the rectifier element which is very much higher than that which appears when the current is flowing in the forward direction. If this reverse voltage exceeds a safe value the rectifier plate will spark over and break down in a manner somewhat similar to the way an electrical condenser breaks down if subjected to excessive voltage.

The maximum permissible reverse voltage depends upon the kind of metal plate rectifier used and also upon the methods used in manufacturing the plates. In general, selenium metal plates will withstand reverse voltages considerably higher than those permissible for other types.

Breakdown due to excessive voltage is preceded by little or no warning and it is up to the designer of the rectifier equipment to eliminate the possibility of such breakdown. He can do this by so proportioning the transformer ratios that even with the voltage controls at maximum and with a normal fluctuation of approximately 5% above the nominal AC supply voltage, and no load in the tank, the maximum voltage appearing across the metal plates will not exceed the

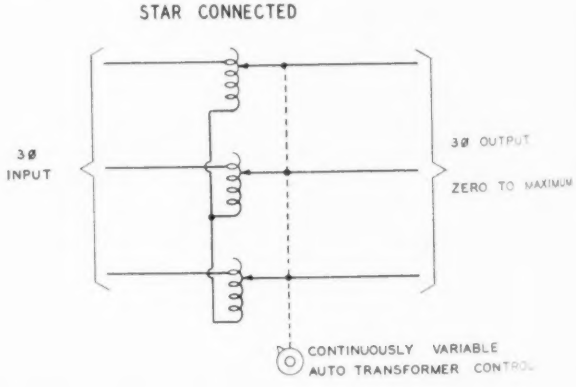


FIG. 13B

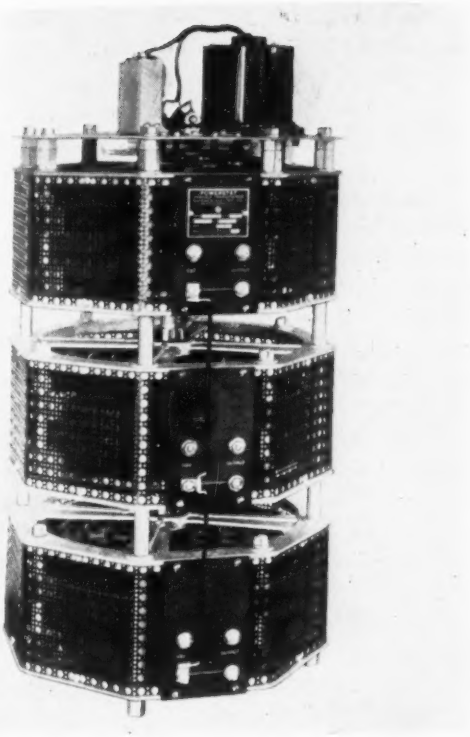


Fig. 14.

permissible rated value. These factors can be computed fairly accurately and conservative design will ensure that breakdown from excessive voltage will be very unlikely.

A much more involved problem is that of temperature rise of the rectifier elements. Again depending upon the type of metal plate and the particular details of manufacture of the plate, there is a maximum permissible temperature of the plate above which it will disintegrate and break down.

Under any given set of conditions the temperature of metal rectifier elements depends upon such factors as the amount of current passing through the plates, the temperature of the local air and the speed with which heat is removed from the plates either by natural cooling (normal air flow due to convection currents) or by forced cooling using fans or blowers.

By using forced air cooling, that is by forcing air between the rectifier plates, it is possible to increase the amount of current that the plates will handle without raising the temperature to dangerous values. With increased current flow there is necessarily an increase in the power dissipated in the rectifier plates in the form of heat and consequently some decrease in efficiency as compared to the theoretical efficiencies obtainable if the elements are operated at low current densities under natural-cooled conditions.

In rectifiers of DC capacities of more than approximately 900-1000 watts the size and cost of natural-cooled rectifier elements would be excessive.

Consequently the designer, in planning fan-cooled rectifier equipment, must compromise between an acceptable overall efficiency and other types of power supply equipment used for electroplating, size of the complete unit, cost of rectifier elements, cost of fans, etc.

In selenium rectifier equipment of the fan-cooled type the plates are usually operated at current densities from 2 to 2.5 times the natural-cooled rating. This results in an equipment which has very satisfactory efficiency but which requires only forty to fifty percent of the number of selenium plates which would be needed if the equipment did not incorporate a cooling fan.

In all fan-cooled rectifier units the basic problem is to draw in air from the outside and pass this air between the plates in order to carry away the developed heat. Every conceivable arrangement has been tried and a number of these are in use by different manufacturers.

In one arrangement the rectifier plates are near the bottom of the cabinet and the air is drawn upward through the cabinet bottom and discharged through the top of the cabinet or through portholes on the two sides of the cabinet.

In another arrangement the transformers are located at the bottom of the cabinet and the rectifier elements are near the top with the air drawn in through the top of the cabinet and expelled through grille panels front and rear and louvres in the sides. This arrangement has the advantages that the heavy transformers may be located at the bottom of the cabinet, and the air intake grille located at the top simplifies the addition of a supply duct if it is desired to bring in air from a source outside the plating room.

Another arrangement, previously used in mobile units for outdoor use but now appearing in a new electroplating rectifier, draws in air from a grille located in the side of the cabinet and expels the air from the opposite side of the cabinet. This arrangement results in a cabinet which is broad and low, and hence requires more floor space, but has the ad-

Fig. 15.

vantage that two or three similar units may be stacked one on top of the other.

Importance of Ventilation

Whatever the particular ventilation arrangement used in the rectifier, it is important that the installation should not in any way interfere with the ventilation system.

In properly engineered rectifier equipment the designer has made sure that the fan or fans incorporated will provide sufficient air flow to keep the temperature of the plates at a safe value provided the unit is not operated above its rated current capacity in normal suroundings, and provided that neither the air intake nor the air exhaust is interfered with in any way.

If the plant layout is such that the rectifier units are installed in a comparatively restricted space then there is the possibility that the exhaust air, which has already been raised a few degrees in temperature by the heat absorbed from the rectifier elements, may be drawn again into the air intake and thus successively recirculated through the unit. Obviously the air will continue to rise in temperature and so will the temperature of the rectifier elements.

This recirculation cycle must be broken either by permitting the exhaust air to pass out of the rectifier bay or by arranging for fresh air to be drawn into it.

The latter arrangement is preferable since air drawn from almost any source other than the plating room is likely to be cleaner, less corrosive and lower in temperature than the atmosphere found in a plating room. Some modern plating rooms are equipped with very well ventilated tanks and in this case it may be possible to locate the rectifier units comparatively near the plating tanks with no special ventilation precautions.

If ventilation ducts, either intake or exhaust, are provided care should be taken to see that the ducts are of ample cross-section and reasonably short so that air flow is not impeded. It is obviously bad installlation practice to equip a 5000 ampere rectifier unit requiring perhaps 6000 c.f.m. with a stovepipe duct 10″ or 12″ in diameter. It is preferable to choose a location for the rectifier unit reasonably close to a shop window and then fit a *large* duct between the rectifier and the window space.

These notes on the importance of ventilation should properly appear in later sections of this series of articles dealing with installation and maintenance, but the subject is so important that it is worth bringing up at this time.

Rectifier Construction—Remote and Local Control

It is possible to limit the major components of an electroplating rectifier to a stepdown transformer, rectifier elements, and a cooling fan. This is the bare minimum required to convert the local AC supply to low voltage DC for electroplating and is usually designated as a "basic rectifier unit."

Generally, rectifier equipments incorporate also a voltage control system such as the tapped transformer and selector switch type discussed in Part I of this series, or the variable auto-transformer type discussed in this article. In addition, meters should be provided to indicate tank voltage and current. One other major component is a circuit breaker switch or a magnetic contactor to turn the rectifier unit on and off by interrupting the three-phase power supply. Auxiliary components include protective devices of various types, pilot lamps to indicate when the rectifier is operating, etc.

If the rectifier unit incorporates in a single cabinet the main transformer, rectifier elements, fan, voltage control system and meters, then it may be described as "self-contained." The self-contained rectifier unit is a complete power package and is the simplest of all to install and wire. For this reason it is generally the most popular type of rectifier unit used for electroplating.

The self-contained unit may be divided into two portions, the smaller of which is the remote control unit and incorporates means for starting and stopping the rectifier unit, voltage control, and meters. In some plants, particularly where a considerable number of rectifiers is involved, it may be desirable to provide separate remote controls for each of the rectifiers, locating the rectifiers at points comparatively close to their individual loads and grouping the remote control units at a central point for convenient supervision and operation. A typical example is that of a full automatic plating machine in which power is required at different voltages and currents for several successive plating processes and intermediate cleaning operations. In such a layout it may be possible to incorporate all of the remote controls for several rectifiers in a single master control cabinet. This allows the operator to keep track of the voltage and current in each cell of the plating machine.

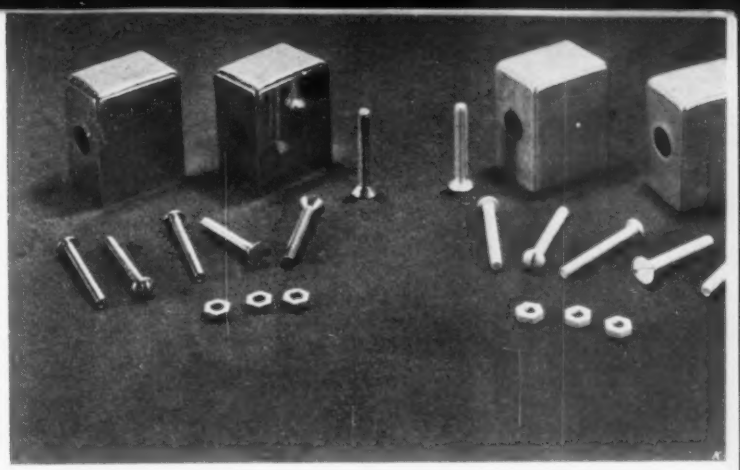
The details of the remote control arrangement depend upon the requirements of the particular layout and considerable flexibility in design is possible.

The motor-driven variable transformers described earlier in this article make it possible to control substantial quantities of power from very compact remote control units incorporating essentially push buttons, meters and pilot lamps.

Rectifier Capacities

Individual rectifier units, either self-contained or of the remote control type, are available in a wide variety of voltage ratings and current capacities. In the 6 volt rating, which is more widely used in electroplating than any other type, units are available in current capacities from 1000 amperes up to 5000 amperes.

In a later article we will discuss how still higher current capacities may be obtained by connecting two or more rectifier units in parallel.



Comparisons of fused and unfused tin plated parts. Fused parts at left, unfused at right.

Fusing of Electrodeposited Tin Coatings

By J. Falk, *Engineer, Western Electric Co., Kearny, N. J.*

A simplified method of obtaining extremely lustrous electroplated tin finishes by fusing of thin coatings is explained in detail. Equipment necessary to perform this operation is listed and control conditions given. Fused electroplated tin coatings give not only brilliance but theoretically have higher corrosion resistance because of less porosity than that of a non-fused coating.—Ed.

THE comparatively widespread use of electrodeposited tin as an outer coating for industrial and commercial purposes is not unwelcome by the plating industry. While tin electrolytes have been long known for excellent throwing power, the several modern types of plating baths offer simpler application and more positive control than ever before possible. However, a factor which may at times deter its use is the appearance of the coating—not of a nature to immediately draw favorable attention.

Electrodeposited tin coatings normally appear as a grayish white matte finish. This finish may have more or less of a surface luster depending upon the type of solution used, the rate of deposition and thickness of the coating. Conceivably, there are occasions when this appearance may be satisfactory, preferable, or even desirable. Nevertheless, while a truly bright tin finish evolved directly from the plating bath is still beyond today's horizon, until such development a brilliant finish of electrodeposited tin may be produced by the performance of a simple operation subsequent to plating.

Such an appearance is effected by fusing the plated coating. The process is neither difficult nor costly, yet there are many who do not avail themselves of it believing the latter facts to be true. There are some who have heard of "fusing" vaguely and others to whom it is entirely new. The purpose of this article is to describe one particular installation successfully employed for the fusing of tin plate on miscellaneous pieces and which may be adapted for use elsewhere.

Fusing Process

The fusing of electrodeposited tin coatings involves the heating of the plated part to a temperature above that of the melting point of the tin, causing the plated coating to change from a dull matte surface into a smooth homogeneous coating which, if properly performed, may seem polished in appearance. In the past, this process presented considerable difficulty from both an engineering and operating point of view. The problems encountered in heating, fume dissipation, dewetting and beading had often proved sufficiently great to force a discontinuance of the process. This no longer need be true. With proper equipment and control the fusing operation can become simple enough for use by the most inexperienced operator.

Fusing is normally performed on tin plated coatings not more than .0005" in thickness, and usually the thinner coatings, those .00005" to .0002", fuse more satisfactorily. On parts with more plating there is a tendency for the molten tin to flow to the lowest point on the part being processed, and excess tin may run off the part entirely. This not only is a waste of metal but in addition may spoil the appearance of the entire piece. However, with the correct combination of proper plating thickness and fusing application, this running may be kept to a minimum or even prevented entirely.

The heating operation may be performed by any means desired. Since the prime purpose is elevation of the temperature of the entire part, it may be heated by electric or gas oven, radiation, induction or immersion—whichever is best suited to the individual case. Due to the relatively slow heat transfer by means of oven or lamp, these methods are usually undesirable. Induction heating is undoubtedly clean and efficient but its relative high cost of installation and limitation in changing from one setup to another

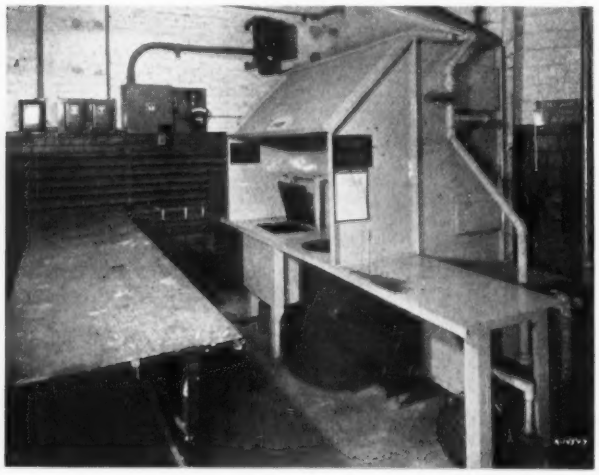
makes this method best fitted for production runs of the same type of part.

Equipment Used

The immersion fusing installation herein described and illustrated was selected as being most flexible for processing a large variety of miscellaneous parts. Comparatively versatile equipment was required since pieces varying in size from small hardware to rectangular cans approximately 8″ on each side were to be finished each day. In this process the fusing medium may be any hydrogenated oil, tallow or petroleum product with a boiling and flash point above 500° F. Suitable vegetable fats and petroleum oils are currently available on the market as are the several types of animal tallow. The latter materials are more economical but may also be somewhat objectionable because of their penetrating odor. Prolonged application or overheating may cause a partial breakdown and carbonizing of the fusing medium. The rate of such breakdown is not sufficiently great to become objectionable however, and the carbon which does form on the surface of the hot liquid may be readily removed.

The fusing is performed in a steel tank with working dimensions of 18″ in length, 12″ in width and 12″ in depth. This tank is electrically heated with 4 one kilowatt strip heating elements placed around the outside and separated from the tank's outer jacket by 3 inches of insulation. A cover hinged in the rear is held in an open position by a chain fastened to a bracket in the rear of the tank. Two fusible links rated at 212° F. are connected in series with the chain, one on either side of the cover, so that should a fire occur the chain would break and allow the lid to drop on the tank, confining the flame there.

Temperature control is of major importance. While the melting point of pure tin is approximately 450° F., the temperature at which fusing is best accomplished is between 475° and 490° F. Since the flash point of the commonly used substances ranges from 525° to 575° F., it is obvious that there is not too much allowance for overheating before the flash point may be reached and a fire occurs. Therefore,



View of fusing area. Electrical and temperature controls on rear wall. Ladle baskets for dipping small parts may be seen below.

Fusing tank at left. Centrifugal breaker at right.

a dual thermostat system was installed. The primary thermostat is of the indicating type and set for the optimum operating temperature. In addition, a secondary controller was installed as a precautionary measure. This limit switch is of the non-indicating type and set at 10° F. above the primary instrument and shuts off the tank heating elements in case of failure of the first thermostat. The instrument is provided with a manual reset in case of such a shutdown of the system and a pilot light indicates whether the heaters are on or off at any time.

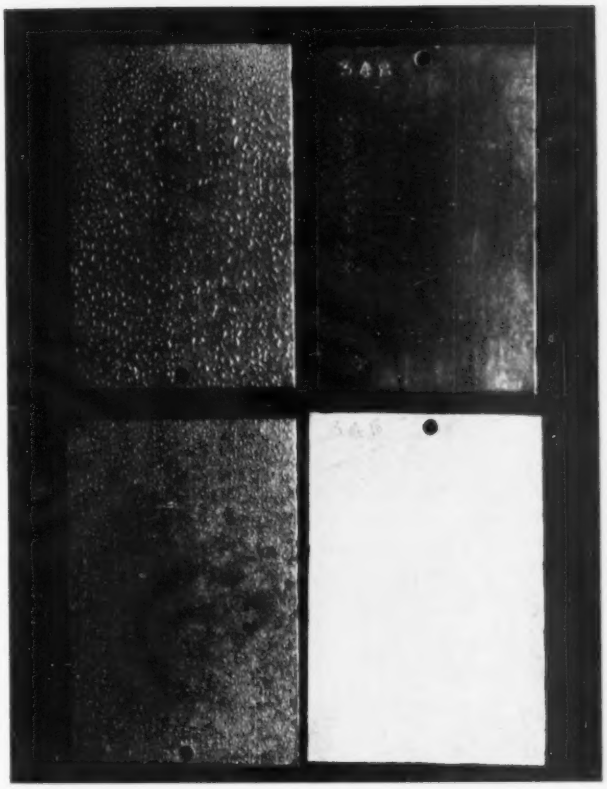
In spite of the relatively high rating of the heating elements and the insulation around them, with the cover of the tank closed it requires two to three hours to bring the fusing medium from room temperature to an operating heat. The cooling of the liquid requires even longer and it is considered advisable to allow the temperature to drop several hundred degrees before closing the lid of the tank in order to prevent undue build-up of heat within the medium chamber. This cooling time is quite significant since the exhaust system should be kept in operation until the cover is placed over the tank in order to eject the fumes of the hot fusing liquid.

An exhaust system is an essential part of such an installation. However, an ordinary duct and blower system would by no means be satisfactory. When oil or fat is heated to the temperatures required by this process, fumes are copiously emitted. These fumes, consisting of minute particles of the oil or fat, readily adhere to anything with which they come into contact. Upon adhesion and cooling the particles solidify and eventually a build-up of fat is created which may clog the exhaust duct and blower. An attempt was made to filter these fumes through fine mesh wire screen and through built-up sections of steel shavings but both methods proved unsuccessful, for while a portion of the fumes were caught in this manner, a large quantity found its way through such a filter and eventually clogged up the exhaust system. It was necessary to devise some means of cooling and catching the minute fat globules before they came into contact and collected on equipment, thus creating a fire hazard and cleaning problem. Working the imagination overtime a little, it appeared that a solu-

time to the problem might be to pass and cool the fat particles in a vapor chamber. It seemed practical to suppose that in such an arrangement the vapors being exhausted would be cooled by the water spray and precipitated to the surface of the water from which it could be readily skimmed. An exhauster was designed utilizing the above principles and was found to be very satisfactory. Essentially, it is similar to an ordinary water-wash spray booth, except that the water curtain section is separated from the fusing tank by a baffle to prevent water splashing into the tank. Should this occur, the situation would be analagous to dropping a cold liquid on a hot frying pan—the drops would shoot off like tiny bullets. As in such a spray booth, the vapors are drawn through a water curtain and spray chamber before being blown outside. All of the medium is satisfactorily caught in this manner, for after twelve months use there is little evidence of its presence in the exhaust duct beyond the booth itself. The material accumulates on the surface of the water in the settling tank and a double set of screens prevents its being recirculated through the water pump. All that need be done, then, is to skim off this material and at intervals clean the water baffles and screens. This interval, of course, is determined by the volume of work processed. As assurance of constant removal of fumes, the exhauster is connected in such a manner that, while it may be operated with the fusing tank heaters shut off, the latter cannot be switched on unless the exhauster is in operation. In order to facilitate the precipitation of the fat globules, a proprietary wetting agent may be added to the water in the settling tank.

Operating Method

In general, the larger parts being fused are either racked or strung on wires for dipping, with care being taken that the individual pieces do not touch as they would then fuse together upon cooling. The parts must be clean and, as mentioned before, absolutely dry upon immersion into the hot medium. They are then agitated in the tank for several seconds until the fusing of the tin is completed. The time of immersion is normally from 3 to 10 seconds and may be controlled visually since the plating change from dull to bright is noticeable even while the parts are covered with the hot fusing material. Upon removal from the tank, the rack is suspended over it for a short time to recover the greater part of the drag-out and then hung on hooks over a drip pan within the exhaust hood. When the parts have cooled and no longer drip, they are cleaned by any suitable means such as degreasing, immersion, etc.



Sample panels—approximately 1½x. Upper and lower left, examples of de-wetting and beading. Lower right, unfused panel. Upper right, fused panel; surface reflection is so great that panel appears dark.

For processing small pieces such as screws, nuts, washers, etc., a centrifugal breaker is provided. This machine consists of a rotator, finned and baffled to separate the parts being processed. The pieces are placed in a long-handled basket, dipped into the hot liquid until the coating is fused, and then dropped into the breaker. Here they are separated by rotation until they fall into a removable pan of solvent located in a chamber beneath the machine. Commercial trichlorethylene which is suitable for this purpose acts as both a quench and degreaser. The breaker has a variable speed of rotation of between 200 and 300 R.P.M. and only about 1 to 2 percent of the smaller flat pieces may become fused together. Most other parts are separated with 100 percent efficiency.

As previously mentioned, the parts being processed must be clean and should be as free as possible of surface oxides. The existence of this latter condition is one of the principle causes of dewetted and beaded surfaces. This dewetting may be manifest as an evenly spaced grouping of small tin globules or

(*Concluded on page* 71)

Close-up of piping of exhauster water circulating pump.

Brass Plating; Routine Chemical Control

By H. E. Zentler-Gordon and E. R. Roberts

The fact that satisfactory bonding depends on both the composition and structure of the brass, necessitates a rigid control of the electroplating process. This paper describes the analytical methods in present-day use. Rapid and accurate analysis of the plating solutions and of the deposits are also given.

THE usual brass plating bath contains copper, zinc and sodium cyanides, to which such substances as NaOH, $NaHCO_3$, and NH_4OH have been added to adjust the pH. The composition is usually expressed in oz/gal; the optimum concentrations and the normal working limits for the main electrolytes are shown in Table I. The free cyanide of Table I is the excess of NaCN over the amount required to form $Na_2CU(CN)_3$ and $Na_2Zn\ (CN)_4$ from the CuCN and $Zn(CN)_2$ in the solution.

The analysis of such a plating solution involves therefore the following determinations: Cu (calculated as oz of CuCN per imperial gallon); Zn (calculated as oz of $Zn(CN)_2$ per gallon); CN (total, calculated as oz of NaCN per gallon); Fe (from impurities or from steel parts); CO_3 (calculated as oz of Na_2CO_3 per gallon). The analysis of the deposit involves only the determination of the ratio of copper to zinc; this may be obtained by determining copper only, if the weight of the deposit is known. The zinc content is then obtained by difference, with occasional checks carried out by determining the zinc content by titration.

In addition to the main plating bath, a number of auxiliary solutions is used in preparing the iron or steel parts for plating. While these must be controlled, the limits of tolerance in composition are much wider. Consequently analysis of these solutions in a short time is much less important, and may be performed using ordinary volumetric or gravimetric methods. These remarks apply to the alkali degreasing, the cyanide strip, the hot 10 per cent sulphuric acid, and the acid strip baths, all of which are analysed and reported on at regular intervals.

The time-consuming analysis are, unfortunately, those which are the most important, namely, those for Cu, Zn, CN (Fe, CO_3) in the plating solution, and Cu and Zn in the deposit. It is to these that the greatest attention has been directed.

Excerpt from a paper presented before the Electrochemical Society, Inc.

Analytical Procedures

Samples of about 50 ml each are withdrawn simultaneously from three different regions of the bath by means of a glass tube about 1 cm in diameter inserted to a depth of approximately 60 cm. Sampling is carried out while the bath is working (and therefore being stirred) and after the temperature and the current density have been checked.

For the determination of copper and zinc by the polarographic method, the sample is freed from suspended matter by filtration through a Whatman No. 5 paper, or by centrifuging; the latter method, while perhaps slightly faster, is not always successful because of the fineness of the suspended particles of zinc ferrocyanide and similar complex compounds which are always present. To 1 ml of the filtered sample in a covered 100 ml tall-form beaker is added an equal volume of concentrated hydrochloric acid. When the vigorous reaction has subsided somewhat, the solution is gently heated on a steam-bath and finally evaporated to dryness. The residue is moistened with a few drops of concentrated hydrochloric acid and the volume made up to 100 ml. This solution now contains approximately 100 mg/L of copper and 40 mg/L of zinc and is thus of suitable concentration for polarographic analysis. The base solution is 4 *N* with respect to both ammonia and ammonium chloride, and contains 2 per cent of xylose to eliminate the maximum due to copper. To 5 ml of this base solution are added 5 ml of the solution prepared from the bath: since only 2 to 3 ml are required for each polarographic analysis, duplicate or triplicate runs can be made on the 10 ml of solution so obtained.

TABLE I

RECOMMENDED BRASS PLATING BATH

Constituent	*Optimum conc.*		*Working limits*	
	oz/gal	*gm/L*	*oz/gal*	*gm/L*
CuCN	4.2	26.3	3.8 to 5.0	24 to 31
$Zn(CN)_2$	1.8	11.3	1.6 to 2.0	10 to 12.5
Free cyanide	2.8	17.5	2.5 to 3.5	15.5 to 22

TABLE II

POLAROGRAPHIC ANALYSIS OF SOLUTIONS OF KNOWN COMPOSITION

Solution	Gravimetric mg. $CuCN$	Gravimetric mg. $Zu(CN)_2$	Polarographic mg. $CuCN$	Polarographic mg. $Zn(CN)_2$
1	1.208	0.613	1.228	0.609
2	1.329	0.636	1.331	0.639
3	1.454	0.696	1.461	0.692
4	1.596	0.763	1.584	0.756
5	1.619	0.774	1.625	0.778

The preliminary work in standardizing a procedure for this analysis was done using a polarograph, which gave photographic traces of the current-voltage curves over the range from 0 to —2.1 volts. In the later stages, when the method was being adapted for rapid routine work, a voltamoscope was employed. While this instrument does not provide an automatic permanent record, it is in many respects more suitable for general laboratory purposes. The readings of the galvanometer may be plotted over the complete range of applied voltage if desired, but if suitable precautions are taken to avoid anode polarization, the copper and zinc may be determined by taking only three galvanometer readings. These are at —0.25v, on the flat part of the curve between the two copper steps; * at —0.9 v, on the flat part between the copper and the zinc steps; and the —1.25 v, on the flat part beyond the zinc steps. It must be strongly emphasized that the shortening of the determination in this way assumes that the anode potential remains constant; a note on this point is included below.

Anode Polarization

Some difficulty was experienced during the earlier stages of the investigation because of anode polarization. The theory of the polarograph assumes that the anode is virtually non-polarizable, whilst the cathode is in a state of complete concentration polarization. The cell supplied by the instrument company is made to work with an external anode, contact with which is made through a thin strip of platinum. So long as a small amount of mercury has formed around this contact, the essential condition of non-polarizability is probably fulfilled, and in the majority of polarographic determinations no inconvenience is experienced. In the case of the above copper and zinc solutions, however, the presence of the xylose tends to hinder the coalescence of the mercury droplets, and at the same time fails to permit effective contact between the solution and the platinum strip. This difficulty may be overcome by placing about 0.5 ml of mercury in the cell before adding the solution to be analyzed. A more convenient cell was designed (Fig. 2) incorporating an agar bridge and fitting it into the electrolysis stand. Whilst the cell is more difficult to prepare, it is less wasteful of mercury, and was found to be useful for a number of determinations before any appreciable errors due to diffusion of metal ions into the agar were encountered; further, the presence of a small amount of dissolved agar overcomes the necessity for removing dissolved oxygen.

* The first copper step occurs at + 0.03 v., and thus does not appear on the current-voltage curves plotted from 0 to —2.1 v.

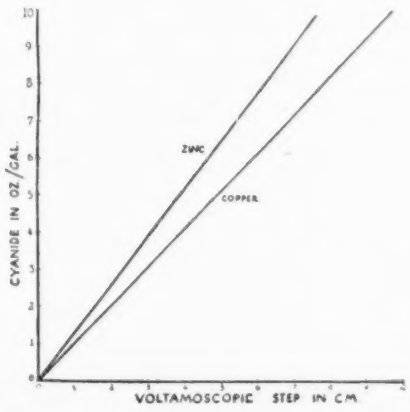


Fig. 1. Calibration curve for voltamoscope.

Copper

For the electrochemical analysis of copper 10 ml of the filtered plating solution are placed in a 400 ml covered casserole, acidified with 10 ml of nitric acid (sp. gr. 1.42) and 5 ml of sulphuric acid, and evaporated to dryness. Heating is continued for a further 20 minutes, the residue allowed to cool and then dissolved in a little water containing ammonia. The precipitate of hydrated ferric oxide is filtered on to a No. 41 Whatman paper, washed thoroughly with hot, ammoniacal water, and the filtrate and washings collected in a 200 ml tall-form beaker. (The loss of copper in this precipitate is too small to warrant dissolution and reprecipitation of the iron, unless particularly accurate determinations are demanded.) If the iron is to be determined, this precipitate is dissolved in hydrochloric acid, the iron precipitated with dilute ammonia, filtered, washed, ignited and weighed. The filtrate and washings are added to the original filtrate. The solution is neutralized with (1:1) sulphuric acid, 10 ml being added in excess, and electrolyzed using a platinum gauze cathode of area 2 dm^2 and stirring continuously. A current of 0.5 amp. is employed until the cathode is completely covered with copper, after which it is increased to 1 amp. Approximately 45 minutes are required to deposit all of the copper. The cathode is washed with water, then with alcohol, and dried at 105° C. for 3 minutes. It is allowed to cool and is then weighed. The copper is stripped by 25 per cent nitric acid, and the cathode washed, dried, cooled and weighed:

Wt. of deposit × 1.408 × 0.161 = oz of CuCN per gal.

For the volumetric estimation of zinc 3 drops of diphenyl-benzidine are added to the copper-free solution from the above determination, and the solution titrated with 0.05 *N* potassium ferrocyanide solution. The latter is standardized against pure zinc oxide. The end-point, which is reached when the indicator changes from purple to pale green, is unreliable if copper or iron is present.

The potassium ferrocyanide solution is prepared thus: $K_4Fe(CN)_6$, 22.0 gm; $K_3Fe(CN)_6$, 0.3 gm; H_2O, 1000.0 ml.

The diphenyl-benzidine solution contains 1 gm. dissolved in 100 ml of concentrated sulphuric acid.

For the determination of total cyanide 5 ml of the filtered plating solution are placed in a 500 ml distilling flask, and 200 ml of water containing 12.5 ml of hydrochloric acid (sp. gr. 1.18) are added. The mixture in the flask is distilled until only 75 ml remain, the distillate being collected in 25 ml of 10 per cent sodium hydroxide solution in a 400 ml beaker. To the latter solution are added 3 ml of 10 per cent potassium iodide solution and the whole is titrated to the first permanent turbidity with 0.1 *N* silver nitrate solution.

Total NaCN in oz/gal = 0.316 × ml of 0.1 *N* $AgNo_3$.

The condenser is rinsed with 10 per cent sodium hydroxide before the distillation, and with water after, the latter rinsings being added to the distillate.

The pH of the plating solutions from baths in production was at first determined directly on the solution, using the Coleman pH-meter. The observed readings were corrected for the "sodium error" characteristic of each glass electrode, but in general routine work it is sufficient to use the uncorrected reading, provided the bath characteristics are known in terms of this reading.

Analysis of Brass Deposits

In the polarographic method the ratio of the two metals is determined and it is, therefore, unnecessary to know the weight of deposit or the concentration of the solution formed from it, provided that the final solution electrolyzed contains approximately 100 mg of copper per litre. The brass deposit is stripped with the minimum possible volume of an ammoniacal ammonium persulphate solution of the following composition: $(NH_4)_2S_2O_8$, 75 gm; NH_4OH (sp. gr. 0.880), 335 ml; H_2O, 665 ml. The copper-zinc solution so obtained is acidified with hydrochloric acid and evaporated to dryness over a water-bath to destroy the excess of persulphate. If it has been necessary to use a large volume of the stripping agent it is advisable to moisten the residue with concentrated hydrochloric acid, take up in water, and again evaporate to dryness. The final residue is moistened with a few drops of concentrated hydrochloric acid, dissolved in water, and the concentration of copper adjusted to about 100 mg/L.

The procedure from this point on is identical with that already described for the analysis of the plating solution. The ratio by weight of copper to zinc is obtained by multiplying the ratio of the polarographic steps by the inverse ratio of the atomic weights; there is no need to refer to a calibration curve, since the absolute figures are not required. Since Cu^{++} and Zn^{++} have identical diffusion coefficients no further correction is necessary.

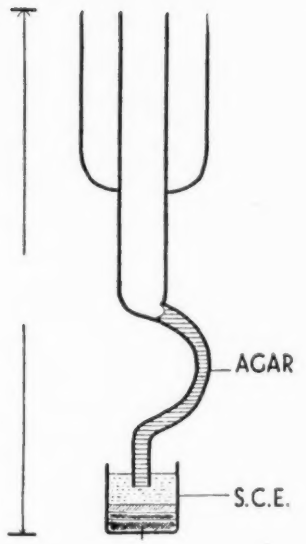


Fig. 2. Polagraphic cell incorporating agar bridge.

For the electrochemical analysis of brass the procedure adopted is to determine the weight of copper and the weight of deposit, or both copper and zinc. The detailed method depends on whether or not the part in question is too large to be weighed:—

(1) If part is too large to weigh, the deposit is stripped with the ammoniacal ammonium persulphate solution already described, and the solution filtered from particles of iron or steel, such residue being carefully washed with ammonia. The solution is evaporated to half its bulk to destroy the excess of persulphate, filtered to remove any iron hydroxide, and the filtrate neutralized with (1:1) sulphuric acid, 10 ml being added in excess. Copper is obtained electrolytically as in the analysis of the plating solution, whilst zinc is determined volumetrically in the solution after deposition of the copper.

(2) If part can be weighed, the article is weighed and the deposit stripped as above; the article is then washed and dried, and reweighed to obtain the weight of the deposit. The solution is acidified with nitric acid (previously freed from nitrous acid by reaction with urea) and the copper determined electrolytically. The percentage of copper is calculated from the copper-brass ratio, and the zinc obtained by difference.

It was found useful to obtain several deposit analyses during an eight-hour plating day so as to be able to control the variations in composition due to a very mixed load of work in a manually operated bath.

Test Deposit

The following preparation of the brass deposit is

made: the test plate (a piece of mild steel sheet, 76 mm x 51 mm x 1.6 mm thick) which has been plated for 20 minutes in a fixed position in the bath is weighed and the brass stripped in 30 ml of the ammoniacal ammonium persulphate solution. The solution is transferred to a conical flask, one pellet of caustic soda added, and the whole boiled on a hot-plate. The steel plate is washed with water and acetone, dried for 5 minutes in an oven at 100° C., cooled and weighed. When the solution has become cloudy due to precipitation of basic copper sulphate, 4 ml of 50 per cent acetic acid are added and the solution boiled for a few more minutes. When all of the precipitate has dissolved, the flask is cooled under running water and the copper determined by the normal iodometric titration.

Routine Control

From a knowledge of the bath volume, the composition of the plating solution, and numerical values for all of the other factors which may be controlled in this process, the necessary additions and alterations in the working conditions may readily be made.

If all other controllable factors can be kept constant, the anode efficiency should easily reach 100 per cent so that no additions of copper or zinc need be made; but in order to maintain good anode corrosion it is necessary to ensure a constant and high free-cyanide concentration. When plating continuously, this is most easily achieved by making suitable additions of sodium cyanide every 3 to 6 hours so that the average concentration over 24 hours for a given area of work plated is constant. This will compensate for losses due to evaporation, decomposition, and dragout. Alternatively, if plating is intermittent, the anodes may be removed from the bath during "off" periods, which will reduce the consumption of cyanide.

In a solution working at a temperature of 75° to 90° F., a pH of 9.5 to 10.6 (measured electrometrically on the Cambridge pH-meter), and a cathode current density of 6 to 8 amp/ft^2 the following adjustments will result in increasing the copper content of the brass deposits: (a) addition of copper cyanide; (b) increase in temperature; (c) increase in current density; (d) decrease in pH; (e)) increase in free cyanide.

Under the same set of conditions as indicated above, the percentage of zinc in the deposit may be increased by adding zinc cyanide, by lowering the temperature, decreasing the free cyanide, or the current density, or by increasing the pH. A small addition of ammonia is a most effective, though only temporary, measure for insufficient deposition of zinc. If the pH is in the neighborhood of 11 (measured electrometrically) an addition of ammonia will not raise it, although the zinc content of the deposit may temporarily increase, but additions of caustic soda or, in certain cases, calcium hydroxide have a marked and permanent effect on the pH. A more lasting improvement or increase in zinc deposition is achieved by balancing the metal ion concentrations, leaving the pH and other factors mentioned as nearly constant as possible.

An important characteristic of brass-plating baths is their good throwing power, i.e., their capacity to deposit plate of constant composition into the recesses of the work. This will vary with the composition of the alloy being deposited but, aside from this, it is a function of cathode polarization, current density, and free cyanide, and may be improved by adjusting any of these variables or by increasing the distance between anode and cathode.

It is naturally easier to control a continuous automatic plating process than an intermittent one. In manually operated baths in which the work varies considerably in size and shape and also in the manner of attachment to the cathode bars, the composition of the deposit will vary with the "local" current density and with the throwing power effect. It is, therefore, useful to check the brass deposit twice or even three times during the eight-hour plating day, especially when the nature of the bath load has been altered. The necessary adjustments are most easily made by slight alterations in the current density. Broadly speaking, any desired alteration in the composition of the deposit can be brought about by acting on one or more of the factors normally controlled in the process, but response to such changes may not always be immediate. If it is essential to obtain a rapid reaction in the electrolyte, the factors to be altered are: (a) temperature; (b) current density; (c) ammonia concentration. Thus an increase in temperature of 2° F., or an increase in cathode current density of 0.5 amp/ft^2 will raise the copper content approximately 2 per cent. Conversely, a similar increase in zinc content can be effected by addition of 0.5 gm/L of ammonia (sp. gr. 0.880), provided that the ammonia content of the solution is of the order of 1.5 gm/L (reckoned as NH_4OH).

The pH of a solution which plates 70/30 or 75/25 brass may vary between 9.4 and 11.0 (measured electrometrically) according to bath composition. For a given bath, the pH should be constant from day to day to within 0.1 to 0.2 unit. Provided the electrode efficiencies are reasonably balanced and that the solution is not allowed to become depleted in metallic cyanides, the pH will remain stable for long periods of operation. While it is best to work with a self-maintaining solution, if depletion does occur it is more expeditious to make small additions rather than alter such factors as free cyanide, pH, or anode area, especially when the load is a varied one. If the pH varies following a temporary failure in routine controls, it is adjusted by making small additions of sodium bicarbonate, or caustic soda, of the order of 0.2 gm/L. The sodium carbonate content of the solution builds up gradually and should not exceed 60 to 70 gm/L; in a well-controlled electrolyte this concentration may be maintained by drag-out effect.

Approximately 2.5 hours are saved by using the voltamoscopic method in preference to the electrolytic-plus-volumetric method, which enables one assistant to perform all of the analyses and recommend alterations in bath operating conditions. Rapid analyses and equally rapid corrections of the variables involved enable the laboratory to keep a constant check on the process even when variable plating conditions and mixed loads are being encountered.

Optical Methods for Evaluation of Metal Surfaces

By Arthur A. Vernon, *Northeastern University, Boston, Mass.* and John Broomfield, *The Comter Co., Waltham, Mass.*

IMPORTANT methods for the evaluation of metal surfaces have been developed in the past few years; these have in turn made possible improvements in high precision machine work. The most widely used instruments have been those using a movable stylus arm traveling over the surface; types of surface standards and scanning instruments have been discussed fully by Broadston.[1]

As early as 1935 Hardy[2] described an optical system for determining the reflection from various surfaces; today a commercial reflection instrument called the "Glossmeter" is commonly used in paint and wallpaper evaluation. The use of a reflection method for evaluation of the quality of a polished metal surface was reported by Gilbertson and Fortner[3] and Young and Brytczuk.[4] Since it seems likely that there will be increased use of optical methods for surface evaluation, this article aims to call attention to the instruments now available. These fall into two classes—those showing a picture of the surface and one which measures accurately the light reflected from the surface.

Surface Pictures

A kit is available which includes a strip of plastic and a solvent. Solvent is applied to a metal surface; the plastic is pressed on, allowed to dry, and peeled off thus forming a replica of the surface which can be viewed in a projector or compared with a standard surface. Herschman[5] has studied this method extensively and developed a surface analyzer for evaluating the replicas. His apparatus consists of a photo-electric cell circuit and an oscillator which moves the transparent replica rapidly back and forth in the light beam striking the cell; by calibrating the developed voltage against known standard surface roughnesses, an analyzed curve can be obtained, and from these data unknown surfaces can be evaluated. Herschman's results showed that the method was particularly suited for evaluation of finely finished surfaces.

An instrument based on visual comparison is also used for the evaluation of metal finishes. This instrument is a dual microscope which views and compares two surfaces simultaneously. A standard surface which has a perfect finish will appear black in the instrument and it is claimed that differences of 2 R.M.S. can be determined satisfactorily.

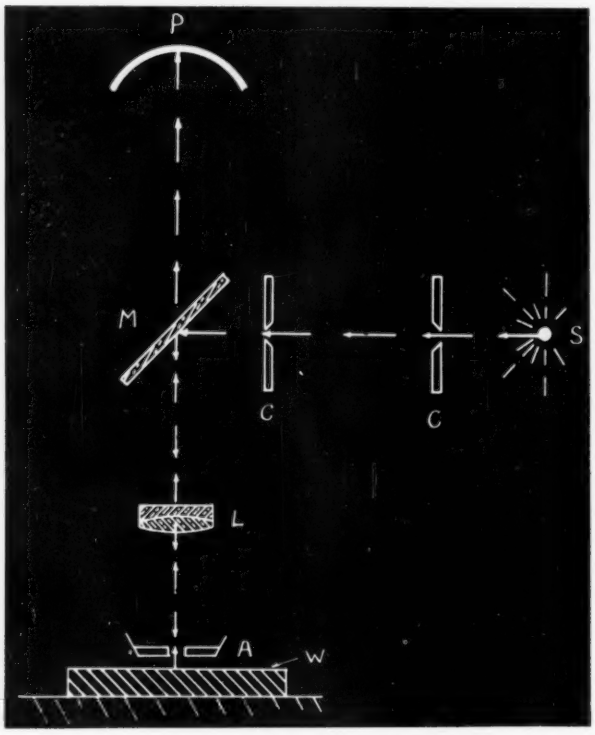


Figure 1. Diagram of comparator.

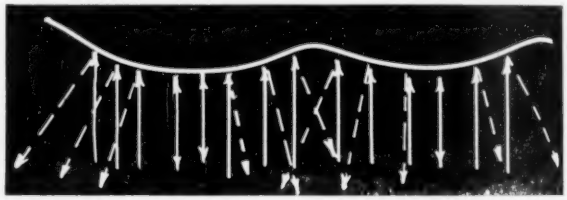


Figure 2. Operating principle.

Reflection Method

A quick scanning surface comparator* which operates on the photoelectric principle is being marketed. A parallel beam of light of small cross section is projected perpendicularly to the work surface and reflected back along the same light axis. It is then received on a photocell and the effect amplified. This is achieved by the arrangement shown diagramatically in Figure 1 where M is a transparent mirror, P a photocell, C collimator slits, S light source, L lens, A lower aperture and light shield, and W the work surface being measured.

The operating principle is thought to be substantially as illustrated in Figure 2. Only light reflected from the crests or included in a very narrow angle is able to enter the optical system and reach the photocell. It is evident that as the finish becomes finer the surface irregularities become shallower, and the crests broader. More surface area is thus made substantially 90 deg. to the projected beam and more light enters the photocell.

Since the overall response is accurately linear the

* Manufactured by The Comter Co., Waltham, Mass.

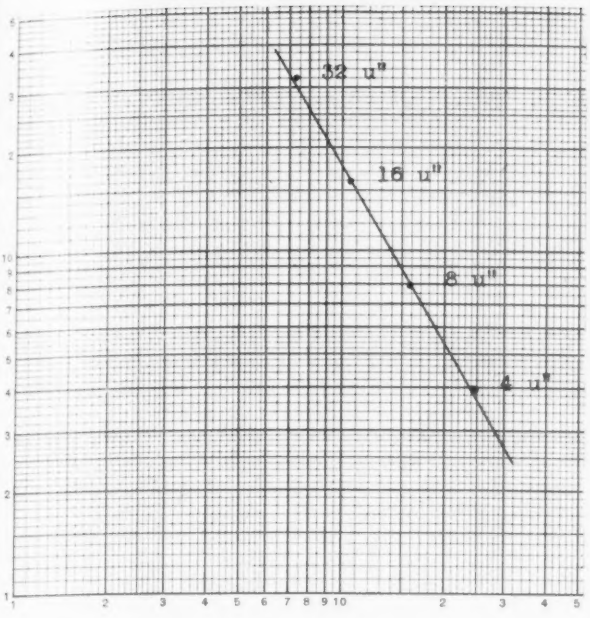


Figure 3. Instrument percent readings of platinum standard; cylindrical standards, ground finish.

instrument can be conveniently calibrated by means of a platinum standard provided. This practically perfect surface of platinum is regarded as 100% finish and the meter is therefore calibrated such that full scale deflection represents 100% with the meter factor switch set at unity. By suitable settings of this meter factor switch five ranges of sensitivity can be obtained, the highest sensitivity being 20% for full scale deflection. Any finish can easily be compared to the standard by simply multiplying the meter reading by the meter factor used.

Either flat or cylindrical work surfaces can be measured and accurately compared with each other provided that the material and the method of producing the finish are the same, as for instance, all ground or all lapped and by the same method of grinding or lapping. The lay of the grain has no effect on the accuracy of the results.

While this instrument does not actually measure the depth of the surface irregularities, there is a close correlation between the microinch readings of a ground surface and the readings for finishes rougher than 3 or 4 microinch R.M.S. Figure 3 made with ground cylindrical standards, shows this relation. It should be noted that the sensitivity of the comparator has an inverse relation to the stylus type instrument for the measurement of surface finish; therefore it is particularly useful for the measurement of highly finished surfaces.

The instrument is of rugged design, able to withstand shop use, and is in fact intended for use on the production line. It is equipped with suitable work holders and a ball bearing carriage and no special skill is required to set it up or operate it.

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FUSING OF ELECTRODEPOSITED TIN COATINGS

(*Concluded from page 65*)

may appear as a rough surface similar to that obtained by "hot dip" immersion directly into the molten metal. Neither type is desirable and both may be avoided by proper control and technique of application.

Fused tin coatings may be applied to both ferrous and non-ferrous basis metals. Any metal that may be tin plated and which will not be affected by the fusing temperature will take a fused tin coating. From a practical point of view, it may be said that the least trouble may be expected when fusing directly on copper or copper plate. However, this does not necessarily hold true in all cases as excellent results may be obtained directly on brass or steel. A recent technical article contains illustrations of successive states of the fusing process as shown by 16 mm. motion picture photographs taken through a microscope by H. J. Francis of the Illinois Institute of Technology. Dewetting and typical crater formations as well as the final beading which results on occasion are shown. It was held that the dewetting and beading became serious only when the part was heated at too high a temperature or held in the molten state too long.

It is not the purpose of this article to compare the relative merits of fused and unfused tin plated coatings as to corrosion resistance. It has been claimed that tests have not shown appreciable differences in this matter.

Conclusion

From a visual standpoint, the difference in appearance between the normal plated matte finish and the bright shining fused coating makes the latter more desirable. Fingermarks and moisture which immediately stain a matte finish leave no such stains on the fused coating, thus simplifying the handling problem. Nor will fused parts tarnish as readily upon storage as will those unfused. Certainly, where appearance may affect salability, the fused coating is by far the more preferable.

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Determination of Free Sodium Hydroxide and Sodium Carbonate in Plating Solutions

By LOUIS SILVERMAN, *Westinghouse Electric Corp., Pittsburgh, Pa.*

A WATER solution of sodium hydroxide, sodium cyanide and sodium carbonate, when titrated with standard acid, gives a result which indicates the alkaline content of sodium hydroxide, sodium cyanide and part of the sodium carbonate. If, before titration, excess barium chloride be added, the titration would then show the combined values of sodium hydroxide and of sodium cyanide.

Sodium cyanide is an example of a salt containing a strong base and a weak acid. This type of salt hydrolyzes to such an extent that its water solution titrates as if it were free sodium hydroxide. The hydrolysis can be prevented by dissolving this type of salt in alcohol. In alcoholic solution the acid and base radicals remain combined, and there is no free alkali which may be titrated with standard acid.

In this manner the free sodium hydroxide content of a mixture of sodium hydroxide, sodium cyanide and sodium carbonate may be obtained. Following the free sodium hydroxide determination the carbonate content may be determined by titration of the insoluble barium carbonate.

Reagents

Alcohol. Denatured alcohol, made alkaline to phenolphthalein by sodium hydroxide.

$BaCl_2$ solution. A cold saturated solution of $BaCl_2.2H_2O$ in water, about 40 grams per 100 ml. It should be alkaline to methyl orange or methyl yellow.

Phenolphthalein indicator. One gram of powder dissolved in 100 ml of alcohol. Add sufficient sodium hydroxide to color the solution a faint pink.

Methyl orange or methyl yellow indicator. One gram dissolved in one liter of water.

Standard alkali and acid. 0.5—N solutions are preferred. The alkali is standardized by titration against Bureau of Standards potassium acid phthalate. The acid is then titrated against the alkali, using methyl orange indicator.

Procedure

1. Free NaOH Determination: Pipette a 10 ml sample into a 300 ml beaker. Add slowly, with stirring, 25 ml of a saturated $BaCl_2$ solution. Add 150 ml of alcohol and 10 drops of a one per cent alcoholic phenolphthalein solution. Stir well. Titrate slowly, with a standard 0.5—N hydrochloric acid solution, until the solution is colorless. Stir one minute and complete the titration.

Calculation:

$$(\text{ml Acid Solution}) \times (\text{Normality of Solution}) \times (0.535) = \text{oz/gal., free NaOH}$$

2. Sodium Carbonate Determination: Add 100 ml of water to the beaker. Stir. Let the precipitate settle completely. Decant through a 15 cm. Whatman No. 7 paper, containing pulp. Wash twice by decantation, using hot water. Transfer the precipitate to the paper, using hot water. Wash the paper and precipitate six times, allowing the liquid to drain completely each time. Discard the filtrate.

Open the paper into the 300 ml beaker. Wash the precipitate off the paper with water. Dilute the solution in the beaker to 150 ml with water. Macerate the paper with a stirring rod. Add 6 drops of one per cent phenolphthalein indicator. Without recording the results, add 0.5N—hydrochloric acid solution until the solution is colorless. Stir to be certain that all alkali has been neutralized. Add 4 drops of a 0.1 per cent methyl orange or methyl yellow indicator. Record the burette reading, and titrate with standard 0.5N—hydrochloric acid until the solution is red, then over-titrate 3 to 5 ml. Record the result. Stir to be certain that all the barium carbonate has been acidified. Back titrate with standard 0.5N—sodium hydroxide until the red color changes to orange or orange-yellow. Record the result. Do not titrate to the phenolphthalein red.

Calculation:

$$[(\text{ml HCl} \times \text{N of acid}) - (\text{ml NaOH} \times \text{N of alkali})] \times [0.706] = \text{oz./gal., } Na_2CO_3$$

Discussion

The method proposed for the determination of free alkali corresponds to the determination of free alkali in soap.[1] In the latter method the interfering salts are sodium soaps

COMPARISON TITRATIONS FOR FREE ALKALI AND FOR SODIUM CARBONATE. RESULTS IN "OZ./GAL."

Zinc Cyanide Baths

Free NaOH		*Sodium Carbonate*	
Proposed Method	*Ref.*[2]	*Proposed*	*Ref.*[2]
4.0, 4.0	5.1	13.4, 13.5	14.3
4.4, 4.5	5.7	13.7, 13.9	15.3
3.1, 3.1	3.4	12.1	13.2
3.7, 4.0	4.6	14.1, 14.2	14.8
3.7, 3.7	4.0	14.1, 14.1	14.5
4.9	4.4 (a)	15.5, 15.6	16.1

Cadmium Cyanide Baths

Free NaOH		*Sodium Carbonate*	
Proposed Method	*Ref.*[2]	*Proposed*	*Ref.*[2]
1.0, 1.0		4.8, 4.8	4.6
1.1, 1.1		12.0, 12.1	11.9
1.4, 1.5		10.8, 10.9	11.0
1.9, 2.1		11.0, 11.2	10.9
1.0, 1.0		4.0, 4.0	4.2
1.1, 1.1		3.3, 3.6	3.5
0.47, 0.55		4.8, 4.8	3.9

Alkaline Tin Baths

Free NaOH		*Sodium Carbonate*	
Proposed Method	*Ref.*[2]	*Proposed*	*Ref.*[2]
2.5, 2.5	2.3	16.7, 16.9	
6.1, 6.3	5.7	15.3, 15.5	
1.3, 1.3	1.1	4.3, 4.4	
2.7, 2.8	2.2	5.4, 5.5	
1.3, 1.4	1.1	4.9, 4.9	
2.2, 2.2	2.1	18.5	
4.6, 4.6	2.1, 2.2	14.9, 14.9	
2.4, 2.4	2.0	4.0, 4.2	
1.3, 1.3	0.9	6.2	
1.8, 1.8	1.4	5.1	

Copper Cyanide Baths

Free NaOH		*Sodium Carbonate*	
Proposed Method	*Ref.*[2]	*Proposed*	*Ref.*[2]
1.14, 1.14		1.8, 1.9	
0, 0 (b)		13.9, 14.1	
0.50, 0.53		1.2, 1.3	
0.33, 0.39		11.3, 11.4	
0.32, 0.40		2.0, 2.2	
0, 0 (b)		9.3, 9.6	
0.48, 0.51		1.8 1.9	
1.03, 1.03		13.6, 13.7	

(a) Molybdate bath
(b) Cyanide-citrate bath

whose hydrolytic constants are similar to that of sodium cyanide.

Several precautions should be noted. The barium chloride must be added in sufficient amount to precipitate all carbonate; if not, some sodium carbonate will be filtered as sodium salt. Barium carbonate is not titrated by acid at the phenolphthalein color change.

In the sodium carbonate determination, when water is added, any residual sodium cyanide hydrolyzes, and the solution becomes pink. This is not free alkali. Most of the cyanide was washed away, but a small amount adheres to the barium carbonate precipitate. This does not introduce any error, because the unrecorded titration with phenolphthalein indicator neutralizes this alkali. Finally, the overtitration with acid and back titration with alkali is more rapid, and probably, more satisfactory than the direct acid titration of barium carbonate.

In the tables comparison results are given. The free alkali determination was made directly using sulfo-orange indicator,[2, 3] and the carbonate determinations were made according to the same reference. All tests were made upon plating baths in operation.

Acknowledgment

The author wishes to thank Virginia Stewart and Ethel Verney, who contributed much of the data as routine analyses.

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(3) 1945 *Plating and Finishing Guidebook*, Metal Industry Publishing Co., New York, N. Y.

This Is Washington

By George W. Grupp, *Metal Finishing's Washington Editor*

The Court's Decision on Lewis and His Miners

Since the United States Supreme Court decision on John L. Lewis and his miners was not a unanimous one (a vote of 7 to 2 on the contempt citation; and a vote of 5 to 4 on the Norris-LaGuardia Act), it may be some years hence before we know the real results of these history making decisions. Justices Jackson and Frankfurter dissented on the right of the Government to a permanent injunction. Justices Douglas and Black agreed that the Norris-LaGuardia Act does not bind the Government, but they dissented as regards the fines. Chief Justice Vinson and Justices Frankfurter, Jackson, Reed and Burton agreed that the $3,500,000 fine for the UMWA is excessive, but they decided to leave the Lewis fine stand at $10,000. Justices Murphy and Rutledge dissented in both decisions.

In summing up his dissenting opinion Justice Rutledge said: "Much more is involved in this controversy than the issues which have been discussed. The issues in the main suit have not been determined and it would be beyond our function to intimate opinion concerning them now. The courts and all other divisions or agencies of authority must act within the limits of their respective functions. Specifically it means in this case that we are bound to act in deference to the mandate of Congress concerning labor injunctions, as in judgment and conscience we conceive it to have been made. The crisis here was grave. Nevertheless, as I view Congress' action, I am unable to believe that it has acted to meet, or authorized the courts to meet, the situation which arose in the manner which has been employed."

Then Justice Rutledge added: "No man or group is above the law. All are subject to its valid commands. So are the Government and the courts. If, as I think, Congress has forbidden the use of labor injunctions in this and like cases, that conclusion is the end of our function. And if modification of that policy is to be made for such cases, that problem is for Congress in the first instance, not for the courts."

Justice Murphy summed up his dissenting opinion by saying that "it has been said that the actions of the defendants threatened orderly constitutional government and the economic and social stability of the Nation. Whatever may be the validity of these statements, we lack any power to ignore the plain mandates of Congress and to impose vindictive fines upon the defendants. They are entitled to be judged by this court according to the sober principles of law. A judicial disregard of what Congress has decreed may seem justified for the moment in view of the crisis which gave birth to this case. But such a disregard may ultimately have more disastrous and lasting effects upon the economy of the Nation than any action of an aggressive labor leader in disobeying a void court order. The cause of orderly constitutional government is ill-served by this misapplying the law as it is written, inadequate though it may be, to meet an emergency situation, especially where that misapplication permits punitive sanctions to be placed upon an individual or an organization."

What Justices Murphy and Rutledge are pointing out is that if the Act meant what it said then Lewis was right. And if Lewis was right, and the court having acted as it did, the United States Supreme Court exceeded the function of courts—to interpret the law and to refrain from legislating into existence amendments to the law. If the courts are permitted the function of legislation, then some have asked: What is the purpose of having a Congress if the courts perform legislative powers by adding to, or subtracting from, Congressional acts? It is their opinion that if the courts are permitted to assume legislative functions it will result in instability and the end of representative government.

Court Rules Foremen May Organize

The United States Supreme Court upheld the National Labor Relations Board order (by a vote of 5 to 4), in the Packard Motor Company case by ruling that foremen are employees and not employers. The effect of this decision is that foremen may organize and bargain for themselves with their employers; and their employers must recognize and do business with such unions. Justice Jackson declared that "the point that these foremen are employees both in the most technical sense at common law as well as in common acceptance of the term, is too obvious to be labored."

Then he added: "The context of the act (Wagner Act) leaves no room for a construction of this section (Section 2(3)) to deny the organizational privilege to employees because they act in the interest of the employer. Every employee, from the very fact of

employment in the master's business, is required to act in his interest. He owes to the employer faithful performance of service in his interest, the protection of the employer's property in his custody or control, and all employees may, as third parties, act in the interest of the employer to such an extent that he is liable for their wrongful acts."

"Even those who act for their employers in some matters, including the service of standing between the management and manual labor," he continued, "still have interests of their own as employees. Though the foreman is the faithful representative of the employer in maintaining a production schedule, his interest properly may be adverse to that of the employer when it comes to fixing his own wages, hours, seniority rights or working conditions. He does not lose his right to serve himself in these respects because he serves his master in others. And we see no basis in this act whatever for holding that foremen are forbidden the protection of the act when they take collective action to protect their collective interests."

What Has Congress Done So Far?

Congressional delays in the preparation and passage of tax and labor legislation are being sharply criticized in many quarters. As a result the 80th Congress is beginning to be called the "Do-Nothing Congress." That, of course, is not an accurate picture of Congress, for it has been busy with many measures, in spite of the too much fighting within the folds of the Republican members, and the cautiousness about passing measures. It might surprise some citizens to know that since its opening on January 3, 1947, up to and including March 17, 1947, a total of 2,887 measures have been introduced by members of the House and 1,095 measures have been introduced by members of the Senate. A total of 17 bills have been enacted into law; one bill awaits the signature of the president; the House has passed on 110 measures; the Senate has passed on 81 measures; a total of 93 measures have been reported to the Senate; and total of 150 measures have been reported to the House. Then on top of this congressional committees have held many public hearings on many measures, including those dealing with labor. It will not be long, and plenty of measures will be passed; and then it may be criticized for manufacturing too many laws.

President's Advisors Studying Annual Wage Guarantee Idea

The President's Council of Economic Advisors, (Dr. Edwin Nourse, chairman; Dr. John D. Clark; and Leon Keyserling), have begun the study of the annual wage guarantee report as handed to the President by the OWMR staff headed by Murray W. Latimer. To what extent the Council will project the research of the report is not known; neither is it clear at this writing what the Council will recommend. However, it is not unreasonable to assume that the idea will be given at least favorable consideration. Certainly the chairman of the Council does not think management is without fault for it is his opinion that the decisions of American business executives since V-J Day have not "added up to anything like a workable solution of the Nation's business problem." He is an advocate of "moderate" wage increases in the lower or medium wage brackets. He feels that "excessive" wage increases would be "merely a source of further demoralization." Up at the other end of the mall one finds that Senator Brien McMahon of Connecticut has introduced a bill which would require companies now paying wage guarantees to file descriptions of their systems with the Secretaries of Labor and Commerce. And in other sections of the country one finds private groups, like the CIO and the United States Steel Corporation, are making studies of the annual wage guarantee idea. Of course it is possible the Council will take advantage of these and other efforts for they are expected to weigh carefully the strong counter-arguments to the idea.

April Is "Defend Labor Month"

The C.I.O. Executive Board unanimously adopted a resolution designating the month of April 1947 as "Defend Labor Month." Because the Board believes that certain labor legislation before Congress is a threat to the continued existence of organized labor, all C.I.O. international unions, local unions, industrial union councils, and C.I.O. members are being urged to demonstrate to Congress that the labor movement is united against the passage of certain proposed legislation which will disturb the present position of labor. They have been instructed to organize (1) mass labor and citizen rallies; (2) shop and plant gate rallies; (3) special radio programs; (4) leaflet distribution campaigns at plant gates and at private homes; (5) petition signing campaigns; (6) delegations to Congress, to state governors, to state legislatures, to mayors, to county officials; to consumer, fraternal and religious organizations; and (7) letter and telegram campaigns.

German Anodizing Methods Described in Report

The Commerce Department's Office of Technical Services has issued a report on "German Anodizing Practice," (PB-49275), which may be bought for $3.00 per photostatic copy. This 33 page report, illustrated with diagrams, treats on the German anodic oxidation methods for forming a protective oxide film on aluminum and aluminum alloy products. The report states that seven companies used an anodizing process requiring a sulphuric acid bath as the electrolyte and direct current as a source power. Seventy per cent of all anodizing work in Germany is said to have used this process. One company in Stuttgart is said to have favored alternating current with sulphuric acid in anodizing porous sand castings, because it believed that such procedure helped to reduce pitting. For a ductile oxide coating on aluminum-copper alloy castings this company used oxalic acid for the electrolyte and an alternating current of relatively high voltage. Another Stuttgart firm found that pistons receiving anodizing treatment were not corroded by lead fuels.

Productivity Will Be Up 30 Per Cent by 1950

The economists of the Labor Department's Bureau of Labor Statistics predict that industrial productivity per man-hour in 1950 will exceed the 1939 level by from 20 to 30 per cent. But to protect themselves against error of prediction they point out that this conclusion is based on the past peacetime trends.

House Passes Suspension of Copper Duty

A bill to suspend the four cents per pound import tax on copper for two years was passed by the House of Representatives on March 12th; it is now in the Senate for action.

40,000 Tons of Copper Must Be Imported Monthly

The Office of Temporary Controls estimates that we must import at the rate of 30,000 to 40,000 tons of copper per month to meet the requirements of American industry.

Antimony Control Eased

The Civilian Production Administration of the Office of Temporary Controls on March 12, 1947 amended General Preference Order M-112 so that antimony users, in applying for allocations, need no longer specify any specific grade of the metal.

1,500,000 Ounces of Silver Shipped to England

During the latter part of February 1,500,000 ounces of silver was shipped from the United States to England on the Queen Elizabeth.

32,000 Tons of Tin Allocated to Tinplate Industry

The Civilian Productive Administration of the office of Temporary Controls has tentatively allocated about 32,000 tons of tin for the tinplate industry for the year 1947.

110,000 Tons of Tinplate to Be Exported

The Civilian Production Administration has authorized the export of 110,000 tons of tinplate during the second quarter of 1947, to be used for the preservation of perishable foods.

Silver Recommendations

Members of the Economists' National Committee on Monetary Policy have recommended "that the Treasury be directed to sell its surplus or so-called 'free' silver at the market price, provided this be not less than the cost (average per ounce) to the Treasury." And they also recommend that "the United States Senate should not revive nor extend the life of the Senate Special Silver Committee. This has been a pressure group operating constantly in behalf of silver mining interests, and its existence and operations have reflected badly upon the objectivity of Congress in matters affecting our monetary system and silver."

Mercury Production Falls Off

The Bureau of Mines of the Interior Department reports that the production of mercury during the last quarter of 1946 was slightly below the level of the first three quarters of the year.

Demand for Platinum

Experts report that the demand for soft platinum is fairly heavy for industrial purposes, but the demand of this metal by the jewelry industry is quiet.

U. S. Copper Exports to Japan from 1936 to 1940

Representative Daniel A. Reed of New York, in addressing the House of Representatives, stated that our copper exports to Japan during the years 1936 to 1940 inclusive amounted to 717,247,918 pounds. In other words our copper exports to Japan were 5,355,471 pounds in 1936; 10,838,709 pounds in 1937; 217,879,738 pounds in 1938; 249,277,000 pounds in 1939; and 233,897,000 pounds in 1940.

Tin Can Size Restrictions Lifted

The Office of Temporary Controls on March 7, 1947 removed the restrictions on the size of metal cans which may be made from terne plate and tinplate.

Fogarty Urges Temporary Suspension of Copper Tariff

In urging favorable consideration of H. R. 1626, Representative Fogarty told members of the House that "many factories and shops are faced with suspension of operations because of the very serious shortage of copper. Many branches of the copper industry will have to curtail operations drastically because there is not sufficient copper available to meet the present demands. The lack of domestic copper has been made up for, to some extent, during the last year by releases of Government owned stock-pile copper. This stock pile is down to the vanishing point. Imported copper has shrunk to a negligible quantity because of the 4 cent tariff. If this measure, H.R. 1626, is approved, the tariff on imported copper will be suspended until such time as the domestic sources are able to produce sufficient copper for the needs of the coper industry in this country."

Arizona Copper Tariff Board Presents Brief Upholding Copper Duty

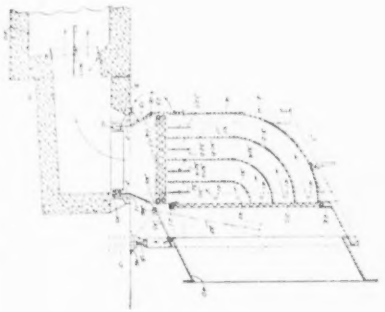
In a brief opposing the removal of the copper duty, the Arizona Copper Tariff Board, says in part: "Copper production is a primary industry in Arizona. That industry cannot exist in this State, nor, indeed, in the United States, if the tariff on foreign copper is removed because of much lower production costs abroad resulting from (a) higher-grade ores, (b) greater ore reserves, (c) low-cost peon labor, (d) lower taxes and overhead, (e) less workmen's compensation, social security, etc., and (f) lower standards of living."

Patents

Fume Removing and Treating Apparatus

U. S. Pat. 2,415,471. *Morton I. Dorfan., Feb.* 11, 1947.

Apparatus for removing fumes that are locally generated by industrial

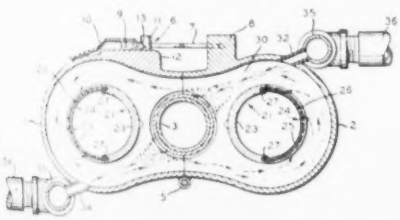


units, comprising a floor-like support adjacent to such a unit and provided with a fume conduit having a horizontally disposed orifice, a removable hood positioned above said orifice having a bottom wall provided with a fume discharging opening registering therewith and having a fume-receiving opening at one of its sides, a removable vertically disposed reticulated wire screen in said fume-receiving opening formed to intercept hard particles entrained in fumes entering the hood, a removable horizontally disposed screen borne by the hood adjacent to said fume-discharging opening and horizontally removable through a side of the hood, and means for applying suction through said conduit and hood to withdraw fumes from such unit through said receiving opening.

Cleaning and Finishing Device

U. S. Pat. 2,415,844. *George C. H. Perkins., Feb.* 18, 1947

A finishing device comprising a unit for embracing the object to be operated upon, said unit embodying a plurality of cooperating sections

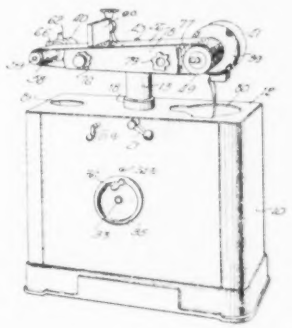


adapted to form a chamber around the object when disposed in association therewith, means for holding said sections together, said chamber being adapted to contain an attritive substance, oppositely directed jets for supplying fluid under pressure within said chamber for creating turbulence to cause said substance to travel around in said chamber and to contact the object, and venting means for said chamber for permitting escape of excess air.

Sanding Belt Machine

U. S. Pat 2,416,493. *Herman S. Newton., Feb.* 25, 1947

A sanding machine including a cabinet having a false top and a removable top section having a work table thereon, a work head supporting column vertically reciprocable in said cabinet, a work head carried by said column comprised of telescopically related tubular members rotatably mounted on said column, means for limiting rotative displacement of said head work spindles mounted on the outer end of each of said tubular

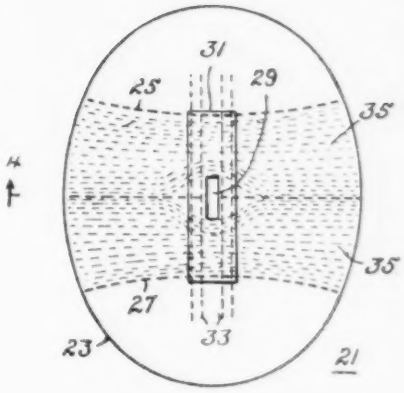


members whose axes are at right angles to that of said members, expansible sleeves carried by said spindles, sanding means on said spindles, a motor supported by one of said tubular members to drive the spindle thereon, means for driving the companion spindle from said first spindle, means for tilting said companion spindle relative to said first spindle, means for raising and lowering said column, and means within one of said tubular members for exerting a constant pressure against the other to maintain tension on said driving means.

Buffing Wheel

U. S. Pat. 2,415,947. *Fritz E. Hendrickson, assignor of one-half to Murray Ireland., Feb.* 18, 1947

A composite buffing wheel compris-

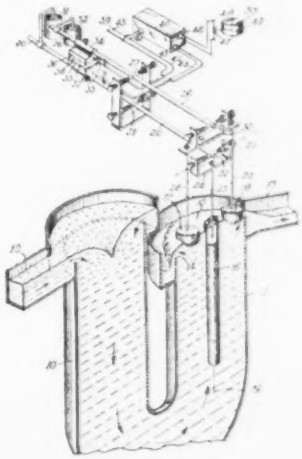


ing a plurality of buffing sections, each section comprising a plurality of sets of centrally perforated cloth discs in close side-by-side position, a plurality of sets of parallel threads of fibrous material between each two adjacents sets of discs, a plurality of seams extending across all of said sets of discs, each plurality of sets of discs being folded diametrically at right angles to said threads of fibrous material and a pair of seams substantially parallel to said first named seams holding together said folded portions.

Liquid Density Measuring Apparatus

U. S. Pat. 2,416,808. *Oscar Weiss., March* 4, 1947

Hydrometer apparatus comprising means to present an air-liquid surface, a balance system comprising two buoyant bodies of different immersion factors to float on said surface and a pair of similar balance beams to which said bodies are severally connected, said balance system adapted to displace said balance beams about equal angles on changes of the level of said air-liquid surface and about differing angles on changes of the



density of said liquid, a stationary measuring device and transmission means between said balance beams and said measuring device, said transmission means adapted to respond exclusively to the difference of said angular displacements but not to the angular displacements themselves.

Chromium Plating

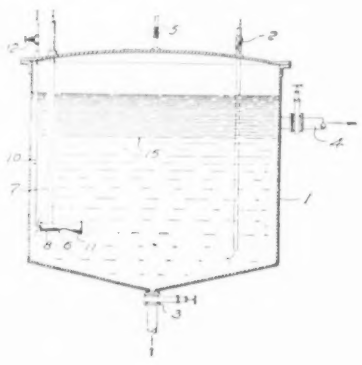
U. S. Pat. 2,415,724. *Frank H. Beall, Feb.* 11, 1947

The process of plating chromium on a surface composed essentially of nickel which comprises; first subjecting the surface to the non-electrolytic action of a solution containing chromic acid as an oxidizing agent and the acid radical of a strong acid to prepare the said metal surface for plating chromium thereon; washing said prepared surface; thereafter immersing the same in a plating bath containing an aqueous solution of chromic acid in part free and in part combined as an alkali salt of chromic acid, the total chromic acid being at least about 30 oz. per gallon of solution and the free acid constituting approximately 20 to 40% of the total, and sulphate catalyst to the amount of not over approximately .65% of the total chromic acid; and supplying plating current to said surface.

Hydrolizing Acid Sludges

U. S. Pat. 2,415,650. *James E. McKee, assignor to Chemical Construction Corp., Feb.* 11, 1947

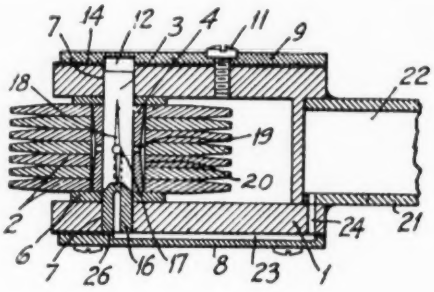
A method of hydrolyzing acid sludges which comprises maintaining a body of dilute sulfuric acid within a vertically cylindrical vessel, introducing a jet of compressed air into a horizontal mixing chamber submerged in said acid adjacent the side wall of said vessel with its longitudinal axis normal to the radius thereof and thereby maintaining a recirculating flow of said acid through said chamber and along the wall of the vessel, introducing acid sludge into said mixing chamber and mixing it intimately with the recirculating acid by the turbulence created by the air jet, and ejecting the resulting mixture below the surface of the acid whereby hydrolysis of the sludge takes place throughout the body of acid and local overheating is avoided.



Emery Wheel Dresser

U. S. Pat. 2,415,790. *Samuel B. Finnerty, assignor of one-half to Harry King., Feb.* 11, 1947

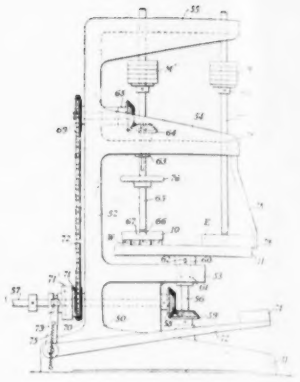
A tool for dressing emery wheels comprising a holder, a shaft upon the holder, a sleeve journaled upon the shaft and having a lubricant delivery passage, a plurality of dressing discs journaled upon the sleeve, and force feed means carried by the holder for supplying lubricant through the sleeve passage to the bearing areas between the sleeve and the discs and shaft.



Grinding and Polishing Equipment

U. S. Pat. 2,415,646. *Benjamin E. Luboshez, assignor to Eastman Kodak Co., Feb.* 11, 1947.

In a grinding apparatus the combination of a rotatable circular grinding disc; a rotatable circular block on which the work to be finished is adapted to be mounted, the diameter of said block being less than the radius of said grinding disc; means for mounting said block relative to said disc so that the block lies entirely to one side of the center of the disc and is completely covered thereby; means for rotating said disc and tool at substantially the same angular velocity and in the same direction, whereby the work is subjected to uniform wear throughout its area; and an elongated stationary compensating shoe frictionally engaging the grinding face of said disc, said shoe extending radially of said disc and having an area varying longitudinally of the shoe and proportioned so as to compensate for the non-uniform wear of the tool resulting from said arrangement of grinding disc and tool which is conducive to uniform wear of the work.



Black Finishing Metals

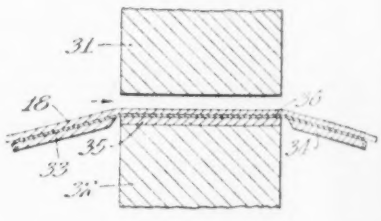
U. S. Pat. 2,415,651. *Howard Nechamkin, assignor by mesne assignments, to Hazeltine Research, Inc., Feb.* 11, 1947

A process for coating a metallic surface formed of a metal from the group consisting of zinc and cadmium which comprises electrochemically depositing on said surface from a solution of a copper salt and a chlorate from the group consisting of alkali-metal chlorates and alkaline-earth-metal chlorates a coating primarily of a copper compound, and treating said deposit in a hydrogen-peroxide solution.

Leather Burnishing

U. S. Pat. 2,416,289. *Bert S. Cross, assignor to Minnesota Mining & Manufacturing Co., Feb.* 25, 1947

A leather working sheet for burnishing and plating leather comprising a flexible base provided with a smooth coating of semi-flexible siliceous material.



Cowles "B" Cleaner

Saves Time and Money

Cowles "B" Cleaner is particularly suited for cleaning steel, brass, bronze, copper and aluminum. This all-purpose washing machine cleaner is fast-acting, free-rinsing, medium pH and dust-free.

Cowles "B" Cleaner is easy to control, does not foam excessively and can be used in *any type* of washing machine.

Here's the cleaner with long mileage and low cost — a trial will convince you — now available.

Cowles Technical Service gladly given upon request

The Cowles Detergent Company

Metal Cleaner Department

7016 EUCLID AVENUE **CLEVELAND 3, OHIO**

Article Coating Equipment

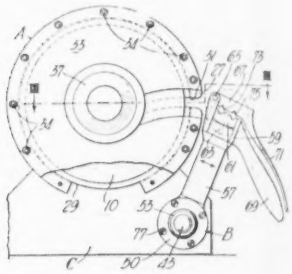
U. S. Pat. 2,416,211. *Harold Osterberg and Paul C. Heijn, assignors by mesne assignments to American Optical Co., Feb.* 18, 1947

In a device of the character described, a vacuum chamber, means for supporting in said chamber an article the surface of which is to be coated, means for distilling coating material for application to said surface, a super-heating chamber communicating with said distilling means and through which said vaporized material is discharged from said distilling means into said vacuum chamber and means for heating said super-heating chamber to a temperature higher than the temperature required to vaporize said coating material to increase the speed of emission of the vaporized particles.

Metal Cutting and Polishing Apparatus

U. S. Pat. 2,415,575. *Hugh G. Brabazon, assignor to Carnegie-Illinois Steel Corp., Feb.* 11, 1947.

Cutting apparatus comprising, in combination, a narrow power-driven abrasive disc presenting a front grinding and polishing surface adapted to separate a metal specimen from a sinkhead, a bracket arm rotatably mounted adjacent to the abrasive disc, mounting means for the bracket arm positioned below the housing and offset therefrom, clamping instrumentalities mounted on the bracket arm for receiving the metal specimen, the said clamping instrumentalities having jaw members adapted to receive the specimen and to restrain the specimen against all movement in the clamping jaws while clamped, means for rotating the bracket arm and clamping jaws for radially



presenting the specimen against the forward grinding edge of the narrow disc at right angles thereto for squarely severing the metal specimen from the sinkhead while avoiding any lateral movement of the specimen during the severing operation relative to the narrow abrading disc, and means for effecting a micrometric adjustment of the specimen laterally of the abrading disc subsequently to the severing operation for adjusting the specimen relative to the narrow abrading disc for enabling removal of any residual high spots from the squarely severed end of the specimen responsively to radial movement of the clamping jaws against a side surface of the grinding disc while avoiding substantial lateral pressure against the thin abrading disc.

Filtering Medium

U. S. Pat. 2,416,524. *Herbert W. Huse and Carl R. Faust and Theodore L. Leininger, assignors to E. I. du Pont de Nemours & Co., Feb.* 25, 1947

In the purification of viscous liquids which comprises passing the solution thereof through a filter medium for separating the solution from solids and jelly-like material contained therein, the process which comprises disposing on a support a composite filter medium comprising a layer of cellulose wadding supported by an over-laying sheet of open weave net cotton material, a uniform layer of sheeted self-sustaining felted fibrous cellulose and a layer of a muslin, and passing the solution through said medium by forcing it first through said overlaying sheet and finally through said muslin.

Shop Problems

Abrasive Methods—Surface Treatments—Control
Electroplating—Cleaning—Pickling—Testing

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Electropolishing Silver

Question: I would like some information about some method of Electropolishing of silver plated ware, and the address of some firm that could furnish me with sheet Brittania Metal and, also handles, spouts and hinges for old tea pots and any other repairs that would be needed. I have looked thoroughly in several issues of the Metal Industry and have not been able to find any thing about that.

F. J. N.

Answer: Electropolishing of silver is still in its infancy and commercial applications have as yet not been developed. Considerable information as to the method may be had by referring to an article entitled "New Method for Polishing Silver Plate" appearing in Iron Age of June 6, 1946. For Brittania Metal and cast parts out of this metal, it would be best for you to contact the American Metal Market Co., 18 Cliff St., New York, N. Y.

Nickel Strip

Question: We would appreciate your advising us on what solution could be used to strip bright nickel. We have used various solutions for stripping but have had no success with it.

F. S. H.

Answer: If the basis metal is steel, brass or copper, an effective strip is as follows:

Sulfuric acid	2 gals.
Glycerine	1 oz.
Water	1 pint

Room temp.; Reverse current, 6 volts, Lead cathode.

Another nickel strip for brass or copper base-metal:

Hydrochloric acid	2 oz.
Water	1 gal.

Room temp.; reverse current, 6 volts; gas-carbon cathodes. Light deposits of nickel may be removed in the ordinary sulfuric-nitric acid bright dip bath.

Copper Finish

Question: Under separate cover I am enclosing a copper tray to illustrate and explain this inquiry. This tray has not been cleaned or given a bath of any kind since coming from the die.

The color I wish to produce is that natural oxidized appearance, shown by the back of the tray, which will run into thousands. I wish to produce this color by a quick dip into some simple inexpensive solution to hasten the oxidization and give the appearance of age.

F. R. C.

Answer: The following formula will give a uniform light brown color on copper:

Copper sulfate	400 grains
Water	2 ounces

Heat solution slightly; immerse two or three times, scratchbrush before immersion.

It is suggested that after you have obtained the appearance desired, the parts be dipped in water-dip lacquer, or spray lacquer on the surface, to protect the finish from oxidation.

Tumbling Aluminum

Question: At the moment I am deeply interested in finding a way to Tumble and Polish over all aluminum body Pen and Pencils. Can you help me in this particular regard?

C. P. C.

Answer: These parts should lend themselves very handily to tumbling and polishing by burnishing methods. It is recommended that you contact a reliable plating supply house, or manufacturers of tumbling equipment and materials. Specialized soaps and abrasives can be had which will give almost any specified finish.

High Caustic in Cadmium Solution

Question: We are having trouble with our cadmium solution, and are giving you herewith our process and would ask if you can be of assistance to us in solving our problem.

Cleaning cycle:

1. Tumble in Keprocess (Kelite) 6 oz./gal.;
2. Cold water rinse (running);
3. Acid (muratic) 5 to 20 min.;
4. Cold water rinse 5 to 45 min. (running);

Then into plating barrel:

Average plating time 15 min.

Plate:

Bright dips well, but there are black spots on some pieces, but even these pieces are bright around the black spots.

My remedy:

Remove some of the solution. Check solution and readjust cyanide and metal content, leaving caustic content along (2.5-3.0) the solution will then plate just fine for a day or perhaps a week then the black spots show up again. On checking I find caustic up around 4-5 oz./gal. again. There has been no additions of caustic—the solution is operated cold, the work does not peel or

blister, and bright dips well right up to the black spots.

The work is regular steel, brass, copper, cast iron, etc. These spots and caustic climbing began all at once about 6 or 8 weeks ago—the work is the same kind of material, is thoroughly cleaned and rinsed. This has been checked several times. What causes the caustic to climb? How can it be knocked down without dumping solution and adding water? Sol. Comp. cadmium metal 3-4 oz./gal.; cyanide 14-16 oz./gal.; caustic 2.5-3 oz./gal.

H. F. C.

Answer: First, would suggest that you check the carbonate content. If excessive, freeze out the excess or remove by precipitation and filtration. In fact, it is a very good idea to transfer filter the solution at least once a week. Second, you must remember that whenever you adjust the metal content by additions of cadmium oxide or hydrate, each ounce is equivalent to adding 0.6 oz./gal. of caustic soda. Would recommend that you obtain metal from the normal corrosion of the anodes. You should have about two pounds of anodes per gallon of solution for proper operation. Third, would suggest that you maintain your solution at a pH of 13. This is equivalent to free caustic soda content of 1.5 to 3.2 oz./gal. By bringing the tank down to free caustic content of 1.5, removing sodium carbonate over 6 oz./gal., (holding minimum of 2 oz./gal.), and by proper amounts of anodes, your solution should be helped.

Copper Brightener

Question: We would like to know what brightener would be best to be used on bright copper.

R. J. S.

Answer: There are several ways this may be done. By increasing the free cyanide content, bright deposits may be had; however, care should be exercised. Similarly, sodium thiosulfate or "Hypo" is a brightener for copper, but too much causes roughness. Solution temperature and current density adjustment may also be necessary. Special commercial brighteners may also be had by contacting any reliable plating supply house.

Stripping Nickel

Question: I have tried stripping nickel from lamps with a brass base using hydrochloric acid in water, reverse current as described in the *Plating and Finishing Guidebook*, but while this method strips the nickel, it also pits the brass quite badly in spots. I have used an acid addition agent in this strip but it does not help. Since I have seen very nice work done on these lamps on the market, I would like to know how it is done.

E. T. M.

Answer: Many platers have had success with the following strip:

Sulfuric Acid 90%
Water 10% (by volume)

Reverse current; room temperature. The standard strip of nickel from steel using sulfuric acid, glycerine and water as described in the handbook is also effective.

It is well to remember that a more uniform and cleaner strip will be had by agitating the work during the operation.

Jewelry Plating

Question: I'm changing over from chloride gold and silver solutions to the formula of gold and silver published in *Plating and Finishing Guidebook*. Could you tell me if these formulas measure up to quart or gallon with water?

Is there any commercial method in two-tone coloring of Jewelry plated in yellow and pink gold? At present I'm using water color paint and glue.

Is there any commercial methods taking fire out of sterling silver chemically?

A. M.

Answer: References to order of measure are listed in the *Guidebook* in gallons; i. e., if you desire to make up only one quart of solution, divide each required amount by four. In two tone coloring of jewelry, two baths are used; by masking off the pink area, plating in the yellow gold bath, and vice versa, the work can be satisfactorily done. For cleaning silver alloy surfaces a 5% potassium cyanide solution may be used; 30% Sodium thiosulfate solution; 3% potassium cyanide plus .1% zinc cyanide.

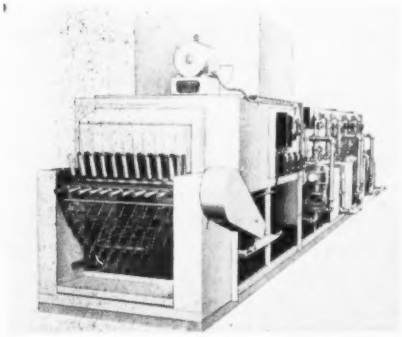
Recent Developments

New Methods, Materials and Equipment for the Metal Finishing Industries

Flat Conveyor Type Metal Washing Machine

The new No. WRDXHCF Optimus Flat Conveyor Type Washing Machine handles the cleaning and processing of metal parts prior to plating. It has just been introduced by Optimus Equipment Company, Dept. MF, 127 Church Street, Matawan, N. J., engineers and manufacturers of metal cleaning and drying equipment.

The new machine handles a sequence of related operations in seven simple consecutive stages: Hot alkali Wash, Drain, Hot Water Rinse, Warm



Cyanide Wash, Cold Rinse to Sewer, Hot Rinse, Dry.

The entire operation takes metal parts directly from processes such as polishing and feeds directly to the plating machine. The two hot rinses are hooked in sequence, thus affecting a further operating saving. Conveyor can also be built with flight bars for baskets and individual pieces, or with a mesh belt for any type of parts in bulk, or individual pieces.

Overall size of machine is 35′ in length, 6′ in width, and 7′ in height. This machine is designed with a belt speed of four feet per minute for a production in excess of 100 parts per minute. Machine can be adapted to a wide range of speeds and types of treatment.

Air Agitation Systems

Equipment for air agitation systems of plating solutions has been announced by the Automotive Rubber Company, Inc. The system consists of a series of tubes connected to a major air source and is used by placing on the bottom of the plating tank.

The units are rubber insulated steel pipes designed to withstand the abuse of falling racks, parts, anodes, etc., and are designed especially for use in copper and nickel plating solutions. The pipes are supported on sturdy legs and apertures are drilled on the under side. The firm also manufactures seamless rubber insulation for all types of plating and ventilation equipment.

For further information write Automotive Rubber Company, Inc., Dept. MF, 8601 Epworth Blvd., Detroit 4, Mich.

Motor Driven Shaker Screen

A portable motor-driven shaker screen for use with deburring and finishing barrels is announced by Almco Incorporated, Dept. MF, Albert Lea, Minn. This unit is claimed to quickly separate the finished work from the tumbling medium, eliminating all hand screening and sorting.

The screen is driven by a ½ h.p. or ⅓ h.p. motor, and vibrates in an elliptical path at 380 reciprocations per minute. Length of movement is

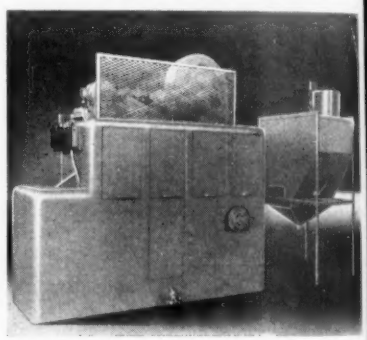
adjustable from zero to ¾″ to meet all requirements. Interchangeable wire screens are available in standard sizes from 3/64″ to 2¼″ openings, and are removed by pushing up and slipping out from between retaining lugs at each end of the frame.

One screening unit will normally serve 3 or 4 barrels and with casters at one end and a handle at the other, it is readily moved where needed. Its over-all height of 24″ (exclusive of the handle) permits this unit to be placed directly under Almco tumbling barrels to separate the load directly on discharge and there is sufficient clearance beneath the screen for a mobile hopper pan to receive the screened material.

Further information is available on request from Almco Incorporated, 20 E. Clark St., Albert Lea, Minnesota.

Automatic Cleaning Equipment

One of the resourceful machines developed recently by the engineering staff of the Cincinnati Cleaning & Finishing Machinery Co., Dept. MF, Ironton, Ohio, is the cleaning equipment pictured below.



Shown on the left is a strip washer for cleaning rubber molding strips. At the right is a dry type spray booth for lacquer spraying the cleaned rubber molding. Both are mounted in approximately the same position as they would be when installed and in actual operation.

The company builds specialized machinery to meet the specific problems of each manufacturer. Cincinnati machines simplify and speed-up metal cleaning, combining the features needed for quick, effective operation with little manual labor required at a remarkably low unit cost, it is claimed.

The firm designs and builds all types of washers including belt conveyor, monorail conveyor, special conveyor and drum types. This includes both custom and standard designs. Each is inspected and thoroughly tested before shipment, according to the manufacturer.

Chrome Coloring Rouge

The J. C. Miller Company, Dept. MF, Grand Rapids, Mich., announces a newly developed chrome rouge, designated as Number 8319.

This rouge is said to excel in coloring prior to applying a baked enamel or lacquered finish when it is desirable to remove highlights by buffing.

Reports from the field show that several important advantages are incorporated in this compound: the rouge produces a fast cut, high color, and presents extreme ease in removal of any burned chrome spots; the compatability of the binder is such as to make cleaning totally unnecessary after buffing. Following chrome colorings, racking, unracking, cleaning and drying are entirely eliminated, it is stated.

Adhesion of enamel to the buffed chrome surface is said to be greatly increased over adhesion obtained on a surface buffed with the usual chrome rouge followed by electrocleaning and is claimed to be the only rouge developed to date wherein perfect adhesion is accomplished. Full details are available from the manufacturer upon request.

Single Dip Rack Coating

A rack insulator and protective coating that builds up 1/16″ to ¼″ thickness in a single dip, has just been announced by The U. S. Stoneware Company, Dept. MF, Akron, Ohio.

The new coating, known as Tygoflex Rack Coating, is based on a new Tygon resin formulation developed to provide thick, impermeable protective membranes for process equipment. When applied by the usual techniques of dipping, spraying, brushing, etc., and subsequently subjected to heat for a very short period, Tygoflex converts to a thick, impermeable insulator, resembling in appearance and physical characteristics a glossy black rubber compound of medium hardness.

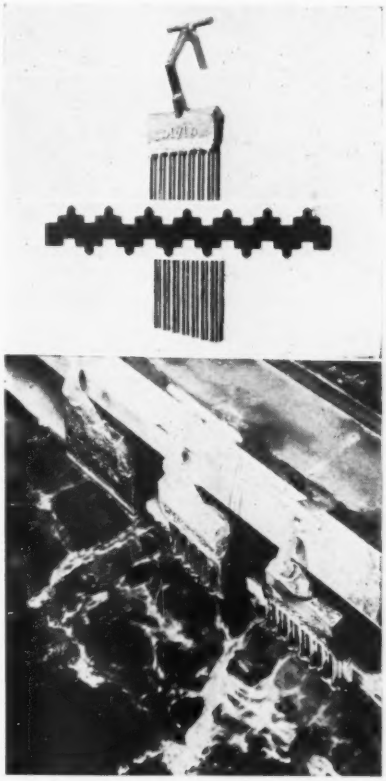
The rack coating is claimed to handle all plating acid or alkaline solutions at temperatures up to 250° F. for an unlimited time. It is also stated to be unaffected by abrupt temperature changes, handling the full range from boiling cleaners to cold rinse.

Application procedure is said to be simple. Racks are coated with adhesive, heated, dipped in rack coating and fused by heat (360° F. for 10 minutes). Infra red lamps or any heating equipment can be used. There is no fire or explosive hazard as the coating is stated to contain no volatiles, solvents, reducers, thinners, etc.

Full details are available on request to Process Equipment Division, The U. S. Stoneware Company, Akron, Ohio.

Chromium Plating Anodes

A newly developed anode for chromium plating baths is announced by the Division Lead Company, makers of lead and lead-alloy products.



The new anode, an antimony-lead alloy, is designed for minimum anode current losses. It is said that comparative tests taken by an unbiased testing group show that the new anodes are over ten percent more efficient than standard designs. Three anodes were placed side by side in a standard chromium plating bath; one was the flat type, the second was the conventional corrugated type, while the third was a 71-point Divco self-scrubbing anode. Much more gassing is stated to have occurred at the Divco anode than at the other two.

The anode is designed with 71 points exposed for the passage of current and the arrangement of the points

is such that a thorough self-scrubbing action by the anode gasses causes greater efficiency and longer life, it is claimed.

The hook is a hot lead dipped bronze casting burned directly into the anode. It is equipped with handles for ease in moving.

For further information write Division Lead Company, Dept. MF, 836 W. Kinzie St., Chicago 22, Ill.

Bright Copper Plating Process

A new bright copper plating process was recently announced by MacDermid, Incorporated. The bath is designed to give bright deposits at high plating speeds and low power cost and is said to be especially effective on zinc die castings and other nonferrous metals.

The standard solution formula is as follows:

Copper cyanide	6 oz./gal.
Potassium cyanide	9 oz./gal.
Sodium cyanide	7.5 oz./gal.
Caustic potash	2 oz./gal.

To this solution is added the proper amount of the MacDermid Bright Copper Makeup. Normal operating conditions are:

Temperature—140 to 160 degrees F
pH—13.0 to 13.5
Current density—15 to 25 ASF at 1 to 1.5 volts

Using the above set of conditions with the makeup, brilliant copper deposits are said to be obtained directly from the solution; the efficiency is claimed to be 100%. Since copper is plated from the monovalent state, high plating speeds are said to be achieved at moderate current densities; as an example, at 20 ASF, 0.001 of copper is deposited in one-half hour.

The solution is controlled by use of the usual addition agents and analysis is for the all standard ingredients. The pH is maintained by the addition of caustic potash, while dragout losses of copper are made up by additions of copper cyanide. No restrictions on the type of anode are placed, although the anode area should be twice that of the cathode area to insure maximum efficiency.

Advantages claimed for the process

include mirror bright deposits obtained directly from the bath; low brightener consumption; simple steel equipment used throughout; use of any conventional type copper anodes; operation performed at low temperature and with low metal concentrations; easy conversion of most standard cyanide copper baths; operation at 100% efficiency, plating monovalent copper; dull burnt deposits can be brightened by reducing current to normal bright current density range; excellent adhesion and throwing power with wide bright plating range; soft deposit making for ease of buffing when desired or required.

For further information write MacDermid, Incorporated, Dept. MF, Waterbury 88, Conn.

Corrosion Resisting Heat Exchanger

The production of a corrosion resisting heat exchanger of an entirely new design is announced by The Duriron Co., Inc. This new heat exchanger is said to be especially serviceable for efficiently heating or cooling small quantities of corrosive solutions over a wide temperature range. The No. 4 size, first of this new line, handles an acid flow of from 4 to 14 g.p.m., with a heating capacity up to 155,000 BTU per hour with 75 lbs. steam and inlet temperature of liquid between 70° F. and 130° F., and a cooling capacity up to 90,000 BTU per hour, based upon 100° F. mean temperature differential. Larger sized units are being developed. Since the Durco No. 4 heat exchanger can be readily connected together in series or parallel, multiple unit installations solve a wide variety of heat transfer problems.

Features of the new heat exchanger include:

1. Separation of steam or coolant from the corrosive by a Duriron tube.
2. Vertical or horizontal installation.
3. No packing against corrosive solution.
4. Removal of parts without disturbing steam or coolant inlet and outlet connections.

Complete construction details, dimensions, installation and operating instructions are given on the Durco No. 4 Heat Exchanger in Bulletin 1610, a copy of which will be mailed upon request of The Duriron Co., Inc., Dept MF, Dayton 1, Ohio.

Business Items

Osborn Manufacturing Appoints Lyndon Cole Chief Engineer

Lyndon C. Cole has been appointed chief engineer of the Machine Division of the *Osborn Manufacturing Company*, of Cleveland, Ohio, according to announcement by *Leon F. Miller*, sales manager of the company's

Lyndon C. Cole

Machine Division.

Mr. Cole was previously associated with the *Cleveland Automatic Machinery Company* as chief engineer and the Cleveland Engineering Office of the *Hydraulic Press Manufacturing Company*.

In his new position, Mr. Cole will have charge of engineering and design of Osborn's foundry equipment division. The company is also the world's largest manufacturer of power brushing equipment.

Michigan Chrome Appoints L. N. Leighte Co.

The Michigan Chrome and Chemical Company, 6340 E. Jefferson Avenue, Detroit 7, Mich., announces the appointment of the *L. N. Leighte Company* as a distributor of *Miccro* products for the plating industry in the Chicago area, with offices at 185 N. Wabash Avenue. *Mr. L. N. Leighte* has a wide background of experience in sales promotion work extending over a period of 20 years.

L. N. Leighte

His activities will be centered exclusively in Chicago and adjacent 100-mile area, servicing and instructing the plating industry in the proper application and use of the newer thermoplastic coatings which the company recently introduced.

This is the fourth appointment announced by the company within recent months, to meet their expanding sales volume of products both at home and abroad.

Iridite Distributors Appointed

Rheem Research Products Inc., Baltimore, has announced a new distributor-sales plan for its product, *Iridite*, the corrosion resistant finish for zinc and cadmium surfaces.

Under this plan, the firm has appointed distributors in all of the nation's industrial areas. Each distributor is equipped to handle new sales and render technical service to customers in its territory.

Distributors appointed to date are:

Western Michigan:
J. C. Miller Company
55 Mt. Vernon, NW
Grand Rapids 4, Mich.

Eastern Michigan:
Wagner Brothers
400 Midland Avenue
Detroit 3, Mich.

Minnesota and West Wisconsin:
Industrial Chemical & Equipment Company
316 Builders Exchange
Minneapolis 2, Minn.

St. Louis and Central Southwest:
La Salco, Incorporated
2820 LaSalle Street
St. Louis 4, Mo.

Chicago, Eastern Wisconsin and Iowa:
Rheem Research Products Incorporated
20 E. Jackson Blvd.
Chicago, Ill.

Ohio and Indiana:
J. C. Baker
711 Park Building
Cleveland, Ohio

New York and New England:
The Mitchell-Bradford Chemical Company
2446 Main Street
Stratford P. O.
Bridgeport, Conn.

Eastern Pennsylvania and New Jersey:
MacDermid Incorporated
Waterbury 88, Conn.

Additional appointments will be announced in the near future.

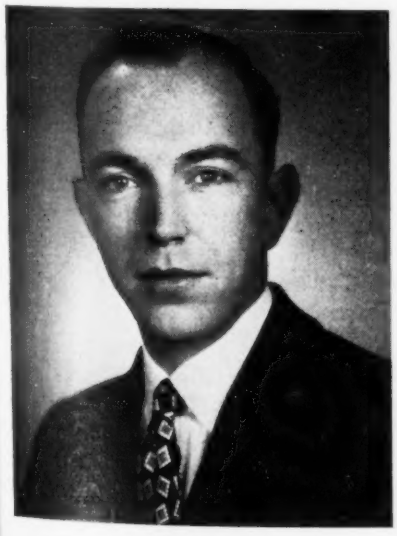
Martin Joins Engineering Staff of Enthone

John J. Martin, Jr. has joined the engineering staff of *Enthone, Inc.*, 442 Elm St., New Haven, Conn. to work on customers service problems attendant with plating equipment and also to work on engineering design of plating equipment.

Mr. Martin received his degree in Mechanical Engineering from Yale University in 1940. He served in the Armed Forces for five years and left the service with the rank of Lt. Commander in the Submarine Service.

While in the Submarine Service, he made nine war patrols in both European and Asiatic waters. He wears the Bronze Star for combat, the Submarine Dolphins, the Submarine Combat Insignia with four stars, and various campaign area ribbons.

He is a member of the American Society of Mechanical Engineers and the Yale Engineering Society.



John J. Martin, Jr.

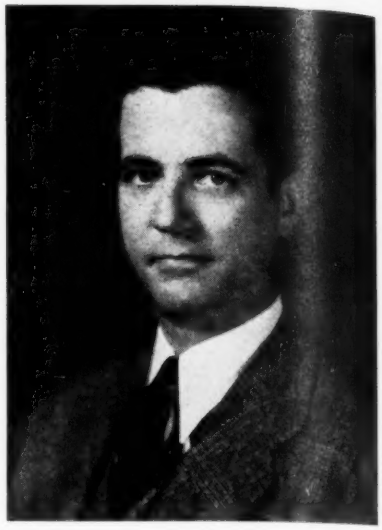
Schenck Elected President of Duriron

Mr. Robert C. Schenck was elected president of *The Duriron Co., Inc.*, Dayton, Ohio, at a meeting of the Board of Directors in February. *Mr. William E. Hall*, former president, became Chairman of the Board. Mr. Schenck is the son of *Pierce D. Schenck*, one of the original founders of the company and its president up to the time of his death in 1931.

Schroy Heads Columbia Rubber Sales

Appointment of *Robert L. Schroy* to direct sales activities of *Columbia Rubber Company*, Ravenna, Ohio, a division of *The U. S. Stoneware Company*, is announced by *Howard Farkas*, executive vice-president and general sales manager of U. S. Stoneware and its affiliated companies.

Mr. Schroy comes to Columbia from *Firestone Tire & Rubber Company* with whom he had been connected for some eleven years. Mr. Schroy is a



Robert L. Schroy

graduate of Miami University, Oxford, Ohio; married and the father of two children.

G & W Plating Co. Formed

G & W Plating Co. has been formed by *Norman I. Ginsberg* and *John O. Walsh.*

A newly constructed plant is now completed and will be set up for electroplating and enamel and lacquer baked finishes. The plant is located at 1357 Seneca Ave., Bronx 59, N. Y.

Osborn Announces Appointment of New Personnel Manager

The appointment of *George R. Lundberg* as personnel manager of *The Osborn Manufacturing Company*, of Cleveland, was announced today by *Norman F. Smith,* vice president and general manager.

Mr. Lundberg, a veteran of 15 years of service with Osborn in its accounting, production and sales divisions, succeeds *T. W. Spoeri* who resigned recently.

In his new position, Mr. Lundberg will be in charge of personnel activities of both the company's machine and brush divisions.

Lieut.-Col. Seppala Commands Air Unit

Announcement of the appointment of *Lieut.-Col. Leslie Seppala* as commanding officer of the 458th Heavy Bombardment Squadron to operate and train at Selfridge Field, Detroit, was recently made by *Col. Charles A. Miller*, air reserve detachment commander at the field. The squadron

will be an air reserve combat type of unit composed entirely of reserve personnel drawn from the Detroit area.

Col. Seppala, a sales engineer for *Michigan Chrome & Chemical Co.*, 6340 E. Jefferson Ave., Detroit 7, Mich., is well qualified to handle the new post, having been a P-51 pilot in the European theater during the war. He is the holder of the Air Medal with two oak leaf clusters and the Purple Heart.

Pennsalt Names Tomlinson Superintendent

Ritner W. Tomlinson has been appointed superintendent of the Easton, Pa., plant of the *Pennsylvania Salt Manufacturing Co.*, announced *Claude S. Beldin*, production manager.

Mr. Tomlinson previously was plant superintendent of the Pennsalt plant at Cornwells Heights, Pa., and the Greenwich plant in Philadelphia. He is a graduate of Lafayette College, with a degree of Bachelor of Science in Administrative Engineering. A native of Elizabeth, New Jersey, Mr. Tomlinson joined the firm in 1926.

Honeywell-Brown Open New Office

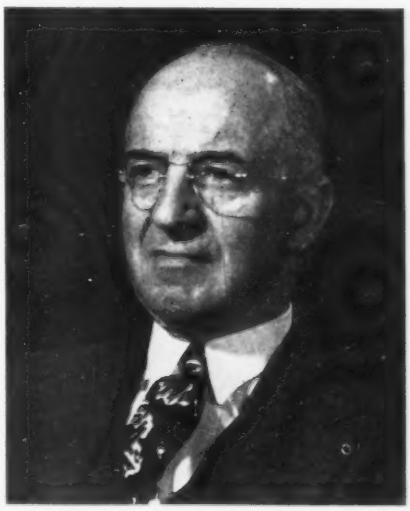
Minneapolis-Honeywell Regulator Company and its industrial division, *Brown Instrument Company*, Philadelphia, have opened a district office at 27 Halstead street, East Orange, N. J.

The new site will operate under New York branch office direction. Spokesmen said it has been established to provide greater sales and service convenience for the expanding New York industrial area. The district office will be manned by six Honeywell and five Brown sales and service engineers.

Lucey to Handle Export Sales for Detrex

Foreign correspondence and export sales of *Detrex Corporation* have been placed in the hands of *Henry J. Lucey*, sales manager of the oil-extraction division, it was announced by *A. O. Thalacker*, vice president and general manager.

His additional duties will place Mr. Lucey in complete charge of following up foreign inquiries and sales in all of the company's three major divisions: industrial metal cleaning, drycleaning and oil-extraction. He will work under *W. W. Davidson*, vice president in charge of sales and advertising.



Henry J. Lucey

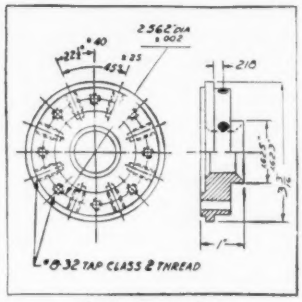
Mr. Lucey came to Detrex in July, 1944, from Washington where he was with W.P.B. in charge of allocating chlorinated solvents. He received his bachelor of science degree in chemical engineering from the Massachusetts Institute of Technology. At one time, he was vice president of *Curtin-Howe Corporation*, a subsidiary of *Westvaco Chlorine Products Corporation*. Mr. Lucey is a member of the American Society of Oil Chemists.

Precision Adapter for Drill Presses Perfects Alignment—Prevents Drift!

The New Aetna Adapter, of aluminum alloy, fits the columns of most small drill presses—assures accurate milling and deep hole drilling—without a drill jig. It firmly and accurately holds interchangeable drill bushings close to work.

Precision alignment is accomplished through an eccentric aligning bushing, which once set needs no further adjustment. Filler bushings cover the entire bushing range up to ½". Stops to locate the piece to be drilled, are attached to the press table or directly to the adapter. Milling chatter is avoided. Chip interference is eliminated. Overlapping holes can be drilled without punch marks, or indication of run-out, with drills as small as 1/32" diameter. ¼" holes can be drilled more than 6" deep with as little as .006" drift.

Accuracy in work is achieved best by alert workers. That's why many plant owners make chewing gum available to all. The chewing action helps relieve monotony—helps keep workers alert, aiding them to do a better job with more ease and safety. And they can chew Wrigley's Spearmint Gum right on the job—even when hands are busy.



Example of piece drilled with Aetna Adapter

You can get complete information from
Aetna Mfg. Co.,
250 Chicago Ave., Oak Park, Ill.

AB-61

Divine Names William C. Beddoe

Divine Brothers Company, manufacturers of polishing and buffing wheels, machine finishing machinery and supplies, truck wheels and casters, announce the appointment of *William C. Beddoe* as advertising and sales promotion manager.

Mr. Beddoe will be in charge of advertising, sales promotion and public relations for all divisions of Divine Brothers Company.

Mr. Beddoe's previous experience includes fifteen years as advertising and sales promotion manager of *Consolidated Petroleum Canada Limited* and two years as promotion manager of *James Lees & Sons Company.*

William C. Beddoe

Marinaro Appointed by Platers Technical Service

Platers Technical Service, Inc., has recently announced the appointment of *Alfred T. Marinaro* as its New York City supervisor. The organization offers a complete service for metal finishers including solution and deposit analysis, process development, plant design, and product styling.

Mr. Marinaro was awarded a chemical engineering degree from Newark College of Engineering and later received his masters degree from Columbia University, where he did research in electroplating under Prof. Colin G. Fink. For the past six years he has been with *Monsanto Chemical Company's* Plastic Division in Springfield, Mass.

For two and one half years Mr. Marinaro supervised the manufacture of polyvinyl butyral resin which was

Alfred T. Marinaro

used by the Armed Forces for ponchos, life rafts, raincoats, etc. His work in process development and research led to co-authorship of several patents pertaining to vinyl resins. Mr. Marinaro joined Platers Technical Service, Inc. in January, 1947.

Lewis Joins U. S. Stoneware Process Equipment Division

Sidney A. Lewis, former captain in the U. S. Army Chemical Warfare Service, has joined the *U. S. Stoneware Company's* Process Equipment Division's sales engineer force, according to an announcement by *Howard Farkas*, executive vice-president and general sales manager.

Mr. Lewis, an authority on electroplating on plastics, will make his headquarters at the New York office of U. S. Stoneware, 60 East 42nd Street.

Sidney A. Lewis

Mr. Lewis is a member of The American Chemical Society, The Electro-chemical Society, The American Electroplaters' Society, and holds the rank of major in the U. S. Army Reserve.

Standard Plating Rack Opens Branch

Standard Plating Rack Company, Chicago, announces the opening of a branch at Fairlawn, N. J. This plant, under the direction of *J. F. Herr* and located at 22-02 Raphael St., will serve the middle Atlantic and New England States in the manufacture of insulated plating racks for all types of metal finishing. An expansion of the company's facilities for making sample racks at the Chicago plant is also reported.

Fraser and French Named Vice Presidents of International Nickel

H. J. Fraser and *H. J. French* were elected as additional vice presidents of *The International Nickel Company, Inc.*, *Robert C. Stanley*, president, announced.

Mr. Fraser has been assistant vice president since June, 1943. Both he and Mr. French are assistant vice presidents of The International Nickel Company of Canada, Limited, the parent company.

A native of Brockville, Ontario, Mr. Fraser joined the Huntington Works company in May, 1923, following his graduation from Queen's University,

Kingston, Canada. After serving for some years in various technical and operating capacities, he was promoted to the New York office in February, 1935, becoming assistant manager of the Production Department.

Mr. French, after receiving the degree of metallurgical engineer from the School of Mines, Columbia University, in 1915, served with the U. S. Army during World War I. In 1919 he joined the metallurgical staff of the U. S. Bureau of Standards in Washington, subsequently becoming assistant chief of the Division of Metallurgy. He became associated with International Nickel in 1929 and was for years in charge of alloy steel development. Assistant manager of the Development and Research Division since September, 1943, Mr. French was recently appointed an assistant vice president of The International Nickel Company of Canada Limited.

Manufacturers' Literature

Bright Copper

A leaflet recently distributed by *United Chromium* describes the reduction of copper buffing costs on zinc die castings by the use of *Unichrome Copper*, according to a finishing executive.

The paper lists advantages of the bath, explaining its mildly alkaline nature, non-toxicity, moderate temperature operation.

The firm offers to send a finishing engineer without obligation for consultation on any problem. To obtain a copy write United Chromium, Inc., Dept. MF, 2751 E. Jefferson Ave., Detroit 7, Mich.

Water Temperature Control

The *Powers Regulator Company's* new condensed catalog No. 3035 is said to contain the most complete line of regulators and thermostatic water mixing valves made for water temperature control.

Thermostatic regulators and valves are shown for: all types of hot water heaters, and 3-way mixing valves for two temperature hot water systems; all types of shower baths, individual, gang and zone showers; hospital hydrotherapy baths; shampoo fixtures; X-ray and photo developing baths; industrial processes and laboratories;

steam and water mixers for dishwashers; and various thermostatic water mixing valves used in washing autos, trucks, buses and locomotives.

For further information write The Powers Regulator Company, Dept. MF, 2720, Greenview Ave., Chicago 14, Ill.

Cleaning Chemicals

A complete series of booklets describing the uses and availability of various cleaning chemicals has recently been issued by the *Columbia Chemical Division* of *Pittsburgh Plate Glass Company*.

The series includes Form A-102 on caustic soda; form A-202 on soda ash; form A-302 on caustic ash; form A-322 on modified sodas; form A-332 on cleaner and cleanser; form A-502 on liquid chlorine; and form A-602 on sodium bicarbonate.

To obtain copies of these attractive booklets, write Pittsburgh Plate Glass Company, Columbia Chemical Division, Dept. MF, 5th Ave., at Bellefield, Pittsburgh 13, Pa.

Dust Collector

A new 19-page illustrated booklet covering the *American Air Filter Co.'s* Type D *Roto-Clone* dynamic precipitator, a device particularly adapted to the dry collection of practically every type of granular industrial dust. Among the many illustrations are detailed views of wear liners, radiation shields, skimmer precleaners, aftercleaners, rotary locks, trickle valves and models E & F contained units together with capacity and dimension table for each size.

Issued free upon request, write American Air Filter Co., Inc., Dept. MF, 215 Central Ave., Louisville 8, Ky.

Polishing Methods

Technical Bulletin No. 6, issued by *Clover Manufacturing Company* covers explanatory material on stationary and portable abrasive disc sanders and study of a method of finishing open-end wrenches on the polishing lathe.

The work is compiled by *E. B. Gallaher* and represents a very instructive paper. Illustrations supplement the text and the method for each operation is described in detail.

To obtain a copy of this bulletin, write Clover Manufacturing Company, Dept. MF, Norwalk, Conn.

Compound Spraying Method

A new book describing in detail the method and equipment used for spraying, buffing and polishing compounds has recently become available by the *J. J. Siefen Company*.

Illustrated and explained is the specially designed air gun made by the firm for use in connection with their other equipment for the successful application of compositions to buffing wheels. The book, entitled *The Siefen Method of Spraying Buffing and Polishing Compounds* also gives the cycle necessary to make set-up wheels by use of spray equipment and cold setting glue loaded with abrasive.

To obtain a copy of this book write

on company letterhead to the J. J. Siefen Company, Dept. MF, 5657 Lauderdale St., Detroit, Mich.

Graphite Heat Exchangers

National Carbon Company, Inc., Dept. MF, 30 E. 42nd St., New York 17, N. Y. announces publication of a new bulletin, *Catalogue Section M8308*, describing standard, seven tube heat exchangers of *Karbate Impervious Graphite* for use under highly corrosive conditions. The exchangers are available in three sizes of 4'3", 7'3" and 10'3" length with effective outside tube areas of 8.2 sq. ft., 16.4 sq. ft. and 24.6 sq. ft. respectively. All these exchangers are said to have the well-known properties of high thermal conductivity and resistance to the action of most acids, alkalis, and other corrosive chemicals.

Tumble Finishing Hints

A brand new booklet of particular interest to manufacturers of cast, stamped and machined metal parts which require a final deburring or finishing process, has just been released by the *Minnesota Mining & Manufacturing Company* of St. Paul, Minnesota.

Entitled "Low-Cost Deburring and Finishing with 'Honite' Abrasive Pebbles," this 12 page illustrated publication tells how costs on one typical finishing operation on an aluminum die cast were cut 90%, as compared to the same work by hand.

Also included are illustrations and descriptions of the various types and sizes of *Honite*, and tips on how each is best used.

Those interested may obtain copies of this new booklet by writing to the Advertising Department, Section MF, Minnesota Mining & Manufacturing Company, St. Paul 6, Minn.

News from California

By Fred A. Herr

Osborn Appoints West Coast Representative

The *West Coast Foundry Equipment Company* has been appointed West Coast sales and service representative of the Machine Division of *The Osborn Manufacturing Company*, of Cleveland, according to announcement by *Leon F. Miller*, divisional sales manager.

It will represent the Cleveland manufacturer in California, Oregon and Washington and will maintain sales and service facilities through its Los Angeles, San Francisco and Seattle offices.

Officials of the West Coast Foundry Equipment Company are well known on the coast. *C. J. Nass*, manager, has been associated with the industry for twenty-three years in the capacity of chemist metallurgist, foundry engineer and foundry superintendent. He organized his present company in August of last year.

Associated with Mr. Nass is *L. O.*

C. J. Nass

L. O. Hofstetter

Hofstetter who is secretary of the Los Angeles Chapter of the American Foundrymen's Association and one of its original founders. He was also chief chemist for the *Washington Eljer Company*, of Los Angeles and foundry engineer of the *Brumley - Donaldson Company*.

O. J. Stoudt, sales engineer, was formerly affiliated with the Washington Eljer Company for six years and later served as sales engineer for the Malleable Division of the *General Metals Corporation* of Los Angeles. He recently returned from four years of service as a Lieutenant in the Medical Department of the U. S. Army.

The company's San Francisco office will be under the direction of *H. M. Donaldson* and *W. A. Dewhurst* will be in charge of the Seattle office. *E. H. Brumley* of the company's San Francisco office, was an officer in the Army Air Corps during the last war.

Appointment of this new West Coast representative marks the first of several steps which Osborn contemplates toward strengthening its nation-wide sales and service organization, Mr. Miller said.

New Los Angeles Plant Opened by Handy & Harman

Open house and luncheon were the order of the day on March 11th as *Handy & Harman* opened the doors of their new West Coast service plant.

The new headquarters are located at 3625 Medford Street, Los Angeles 33. They will house the sales department and manufacturing facilities for users of precious metals. All of the

company's products, including silver brazing alloys and fluxes, sterling silver and karat gold sheet and wire, silver anodes, sterling and fine silver grain will be produced at this plant. A complete refining service is included for recovering precious metals from scrap and waste.

Among the speakers at the luncheon were *Mr. C. W. Handy*, chairman of the company, *Mr. G. H. Niemeyer*, president, *Mr. O. R. Caldwell*, Assistant Mayor of Los Angeles. Guests from manufacturing jewelers, silversmiths, industrial users of silver and film processing laboratories totaling 167 attended.

The new plant will operate with *Mr. H. A. Folgner* as manager. It is the company's fifth plant, others being located in Bridgeport, Conn., New York, N. Y., Providence, R. I., and Toronto, Canada.

Gibson Gets New Post at Kelite

L. C. Sorensen, president of *Kelite Products, Inc.*, this week announced

A. T. Gibson

the appointment of *A. T. Gibson* to the new office of assistant to the president.

During the war, Gibson served with the U. S. Engineers as a Civilian Attache, and has been connected with the firm since that time. He is a graduate of the University of California at Los Angeles, where in addition to starring on the gridiron he majored in Economics, Business Administration and Engineering.

Gibson is supervising the development of the new Kelite manufacturing plant in Los Angeles. This property is several acres in extent and is located within a few blocks of the Los Angeles Civic Center. Already constructed are

new factory buildings for *Tivit Products Co.* (subsidiary making steam cleaners and other cleaning equipment), *Kenn Products Company* (subsidiary making household cleaning materials), the new pH Laboratory, and a large tank farm for storing liquid chemicals. When the main manufacturing plant and administration offices are opened later in the year, this will be one of the largest and most modern plants in the country manufacturing cleaning and processing materials and equipment, it is said.

Harry G. Allen, owner of the *Faith Plating Co.*, 7174 Santa Monica Blvd., Hollywood, has established a special pickup and delivery route to provide expedited plating service for clients located in the downtown area of Los Angeles on a 3-time-a-week basis.

Allen, now active head of the firm, acquired it upon his return from Naval service from *J. F.* and *M. F. Baeth*, who established the company in 1934. He reports the Hollywood shop now is devoting full time to plating and finishing automotive parts and accessories. In addition to chroming bumpers, grilles, moulding and body trim, the company recently expanded its facilities to include bright nickel, gold and silver plating. The modernized plant has 6,000 square feet of working area.

Chrome-Nickel Plating Co. has completed a 500 square foot addition to its facilities at 3224 Tweedy Blvd., Lynwood, Calif. The firm specializes in nickel and chrome plating of brass plumbing fixtures. Associated in the operation are *Fayne B. Board* and *E. C.* and *John B. Hamor*.

Pacific Division, Trumbull Electric Mfg. Co. has moved from 810 east Third St., Los Angeles, to a new 60,000 square foot building at 11115 Van Owen St., North Hollywood, where the entire operations pertaining to manufacture of electrical control equipment were consolidated in mid-February.

The wife of *John Huber* of the *Pacific Enameling & Plating Co.*, Los Angeles, died March 10.

An enlargement program recently completed by *Western Stove Co.*, 8536 Hayes Ave., Culver City, includes the erection of a 5,000 square foot plant addition and installation of considerable new equipment in the enameling department.

New incorporations in California announced during the past month include the following:

Green Brazing Service, South Pasadena, by *Lewis B. Adams, Thomas C. Leahy* and *John D. Green*, all of Los Angeles.

Miller Materials Co., organized in Oakland with a capital stock of $200,000 for manufacturing and processing all types of metal products by *August J. Miller, Sr.*, and *Melville Miller* of Oakland, and *August J. Miller, Jr.*, of Berkeley.

Felton Aluminum Co. incorporated at Santa Cruz for fabricating aluminum and magnesium alloy permanent mold castings by *Anthony Condos* of Los Angeles, *E. T. Lincoln* of Santa Cruz and *William N. Huntals* of Huntington Park.

Pacific Coast Tank & Mfg. Co., Los Angeles, incorporated by *C. S. Thompson* of Long Beach, *George E. Clark* of Bellflower and *G. Schatzlein* of Fullerton.

Higgins Products, Inc., 2,500 shares, no par, established for the manufacture of silver and metal polishes by *Richard C. Vogel, Dean L. Simmons,*

both of Los Angeles, and *C. Van R. Holmes* of Burbank.

Ace Wire Products has completed moving its manufacturing facilities into a new plant at 3765 South Main St., Los Angeles, where it produces wire lamp frames and other wire products.

Associations and Societies

INDUSTRIAL FINISHING EXPOSITION

A large portion of the Exposition space has, at this early date, been reserved by Manufacturers and Suppliers to the Metal Finishing Industry. Many of those exhibits will be in operation. The Exposition is being held in Detroit, June 23 to 27, 1947.

A representative group of manufacturers of plated articles have reserved space, and will display a wide range of finished products to create interest in plated finishes. Those displays will be of great educational value to the general public who will be cordially invited to attend.

The *American Electroplaters' Society*, whose headquarters will be in the Hotel Statler, will hold five technical sessions, covering a wide range of subjects of great interest to electrochemists and process engineers.

The subjects to be covered in those sessions will embrace many advancements made in the Electroplating field as a direct result of developments brought about through experience obtained in war production activities. No one should miss the sessions.

Hotel reservations for the duration of the Convention may be made by applying to *Mr. Jesse E. Bunch*, Chairman of the Housing Committee for the Exposition, at Exposition Headquarters, 4484 Cass Avenue, Detroit 1, Michigan. Standard reservation forms will be provided by the Committee or any A.E.S. Branch.

SOUTHERN MACHINERY AND METALS EXPOSITION

Manufacturers from the Atlantic Coast to Texas and from Florida to Ohio will exhibit at the Southern Machinery and Metals Exposition, to be held at the Municipal Auditorium in Atlanta, April 14-17.

A total of 200 exhibitors will have displays at the Exposition. This will include practically all of the exhibitors of last year's show, which drew a crowd of 7,500, as well as a goodly number of newcomers. Arrangements are being made with Atlanta hotels to reserve 1,000 rooms for exhibitors and their guests. Rail, air and bus lines are also being requested to augment their services to bring an estimated 25,000 exposition guests to Atlanta.

Exhibits will range from displays of small tools and processing equipment to the products of foundries and textile manufacturers.

There will be an industrial forum in connection with the Exposition, during which southern industrial experts will discuss such matters as plant lay-out, welding, labor relations, and sales distribution.

R. S. Lynch, vice-president of *At-*

lantic Steel Co. is president of the 1947 Exposition. Other officers include *Alva S. Wilson,* vice-president of the *Auto-Soler Co.,* vice-president; *deWitt H. Gunsolus, Eclipse Fuel Engineering Co.,* treasurer; and *Michael F. Wiedl,* managing editor of *Southern Machinery and Metals* magazine, secretary and managing director.

Reservations for space should be directed to Michael F. Wiedl, Managing Director, Southern Machinery and Metals Exposition, P. O. Box 4687, Altanta 2, Georgia.

AMERICAN ELECTROPLATERS' SOCIETY

New York Branch

The annual Educational Session and banquet of the *New York Branch* of the *American Electroplaters' Society* is to be held on Saturday afternoon and evening at the Hotel Pennsylvania, April 19, 1947.

The Educational Session will be held in the Salle Moderne of the Pennsylvania and the following speakers and the subject of their talks are to be given:

Metallizing Plastics
Harold Narcus
Electrochemical Industries
Worcester, Mass.

Plating on Die Castings
Walter Prine
International Nickel Company
New York, N. Y.

Significance of Polarization in Electroplating
H. Bandes
Sylvania Electric Products Co.
New York, N. Y.

The banquet, entertainment and dancing will be held in the Roof Garden of the Hotel Pennsylvaina. Reservations may be made by contacting *Mr. Milton Nadel,* 41-15 50th Ave., Long Island City, N. Y.

New England Regional Meeting

The *New England Regional Meeting* of the *American Electroplaters' Society* is to be held in New Haven, Conn., on April 26, 1947. This is the eighth such annual affair being held by the New England groups.

The Technical Education Program will be held from 2:00 P. M. to 5:00 P. M. in the Hotel Taft ballroom under the chairmanship of *I. Laird*

Newell, who is the technical consultant at the Henry Souther Engineering Corporation, Hartford, Conn.

The speakers and their subjects will be as follows: *Dr. D. T. Ewing*, Professor of Physical Chemistry, Michigan State College, "Removal of Metallic Impurities in Nickel Solutions"; *Mr. Paul Swartz*, Chief Metallurgist, L. C. Smith & Corona Typewriters, Inc., "The Effects of Heat Treatment on Tumble Deburring"; and *Mr. George Jernstedt*, Mgr., Electroplating Projects, Westinghouse Electric Corp., "Periodic Reverse Plating."

The ladies program will begin at 2:30 P. M. with a matinee at the Shubert Theatre, New Haven. The banquet will start at 7:00 P. M. in the Hotel Taft Ballroom and there will be entertainment and dancing. Tickets are $5.00 each and reservations may be had by writing *H. L. Kellner*, Chairman, 16 Cherry Ave., Waterbury 86, Conn.

Buffalo Branch

A very large group were fortunate in hearing *Dr. J. E. Stareck* director of research of *United Chromium Corp.* give a very informative talk of "Electrocolor and Patternplate." at the February meeting of the*Buffalo Branch* of *A.E.S.*

Vice president *C. J. Wernlund* presided in the absence of president *Seibert Johnson*, who was enjoying a vacation in the slightly warmer clime of Florida.

Chicago Branch

The regular meeting of the *Chicago Branch* of the *American Electroplaters' Society* was held on February 14th at the Atlantic Hotel. About 100 members and guests were in attendance.

During the course of the business meeting, it was announced that the Annual Technical Session and Banquet for 1948 would be held on Saturday, January 31st.

Mr. O. B. Gordon of Behr-Manning discussed the wide variety of uses of coated abrasive belts for polishing, which is a subject of interest and importance at this time because of the difficulties experienced in obtaining glue for set-up polishing wheels. Mr. Gordon outlined the methods of use, gave a rather detailed description of the abrasive grain sizes available in polishing belts, and also the dimensions of the belts which can be furnished promptly. Further items touched upon were the length of life of abrasive belts and set-up polishing wheels. In this connection, Mr. Gordon advised that in his experience, the comparison was very favorable. He also gave details on the type of lubricants which he had found satisfactory for use with belts. In using this method of polishing, certain types of equipment supplementary to a polishing lathe are of definite importance. One is a back stand idler, another is the various kinds of wheels to be used on a lathe in conjunction with belts. The wheels may be rubber base, felt, or pneumatic. Strapping operations, of course, may be employed with ease, besides the obvious use of the face of the wheel for polishing.

After the meeting, Mr. Gordon and three other gentlemen from the Behr-Manning, the *Messrs. Thorson, Sol-*

mons, and Brooks, gave a practical demonstration of belt polishing methods on a small lathe which they had set up in the hall.

The interest in this method was considerable, as shown by the discussion that followed the meeting, and also by the attention which was paid to the practical demonstration.

The question box was pretty well loaded also.

Twin City Branch

The *Twin City Branch* of the *American Electroplater's Society* met Monday, March 3rd, at 7:00 P.M., at the Covered Wagon Cafe in Minneapolis. There were 48 persons present.

President Gordon Lillicrop called the meeting to order with the introduction of guests. They were, *Messrs. John Mitchell*, Pako Corporation, *James Sargeant* of A. C. Beck Company, *Verne Grossman* and *Louis Zuick* of National Plating Co. *Mr. Meredith, Mr. Wilson* and *Mr. Bonine*, all of General Mills, Inc., and *Mr. Fred Strom* of Speed-O-Lac Products Company. Following the introduction of guests, *Mr. A. T. Leonard*, Membership Chairman, introduced our new members, who were *Mr. O. W. Nealy* of Oakite Products and *Mr. W. K. Jansen* of Northern Ordanance, Inc.

President Lillicrop announced the appointment of two committees. They were the Party Committee headed by *John Lynard* and to be assisted by *Hal Johnson* and *Ralph B. Maddock*. The Nominating Committee is to have *T. A. Bouman* as Chairman and *Jerome Weller* and *H. E. Dimick* assisting.

Mr. R. M. Krieger, Branch 2nd Vice President, made an announcement regarding the new name cards and requested each member to turn theirs in after each meeting.

Following the business meeting, *Dr. Walter Meyer* of Enthone Company spoke on "The Preparation of Metals for Electroplating." Dr. Meyer also showed slides of his recent trip to Florida and Nassau.

Los Angeles Branch

The *Los Angeles Branch* of the A.E.S. held its regular monthly meeting at the Los Angeles Elks Club on the night of February 10 with 77 members and guests present.

In opening the business session, *President D. N. Eldred* commented on the explosion in the *O'Connor Electro-*

plating Corporation's plant on February 20.

Mr. Eldred, who was one of seven explosive and chemical experts who served on the 9-man coroner's jury which heard evidence on the blast at the inquest in mid-March, pointed out that while there are no more hazards in the average plating shop than before the explosion occurred, the O'Connor tragedy will probably result in more stringent investigation of plating shops.

On the whole, Mr. Eldred said, the investigation by the city should benefit the plating industry as it will get some of the more carelessly operated establishments cleaned up, result in having stocks properly separated, and have additions to solutions handled by competent workmen. He pointed out that some shops make it a practice to have only one man in charge of all supplies. In some shops the foreman only is responsible for the solutions and the handling and keeping of chemicals, Mr. Eldred explained, which he said he thought was a sensible method.

The proposed revisions in the Supreme Society constitution were referred to the Board of Managers for consideration with instructions to make a report and recommendation at the April meeting. *Ernest Lamoureaux* was invited by the president to serve in an advisory capacity on this matter to the board of managers, which is comprised of *E. W. Wells* (chairman), *Earl Coffin* and *Don M. Bedwell.*

The branch accepted the invitation of *Frank Bunker* to hold the next meeting on the premises of the *L. H. Butcher Company's* new Los Angeles plant and to make an inspection of the facilities after the meeting.

The following guests were introduced: *M. P. Oliver,* U. S. Marine Corps; *F. J. Arata,* Maas-Waldstein Co.; *Paul Henderson,* Esquire Plating Co.; *Thomas Foster,* Latex Seamless Products Co.; *John Richards,* Richards Rack Co.; *Morton Schwartz,* Pittsburgh, Pa. Branch, A.E.S.; *H. B. Chase,* Medford Chemical Co., *E. J. Mooney* of the same firm; and *John E. Roberts.*

The educational session was featured by two outstanding talks. *Wallace G. Imhoff* of the Imhoff Company, Los Angeles, a recognized authority on pickling and hot dip metallic coatings and author of many scientific and technical articles, contributed *An Interpretation of the Action of Inhibitors in Pickling* out of his 27 year collection of data on this subject.

As the second speaker, *Librarian Gilbert J. Extale* introduced *Sterling Pratt,* representative of the National Carbon Co. Mr. Pratt discussed *Karbate* equipment and outlined various ways in which such equipment finds application in the plating industry. This was followed by the showing of a film entitled *Carbon Black Treasure,* in which the production of carbon electrodes, from the mining of the raw material to the storing of the finished units, was depicted.

Annual Educational Session

Samuel Glasstone of Berkeley, Calif., internationally known lecturer and writer on metal finishing subjects, headed a program of notable personalities who addressed the 14th annual educational session of *Los Angeles Branch* of the *American Electroplaters' Society* at the Los Angeles Breakfast Club on March 22.

Gilbert Extale of the *General Elec-*

tric Company engineering staff, Ontario, Calif., presided at the sessions in his capacity as librarian of the branch. The program was presented in two meetings in the morning and afternoon and drew an average attendance of 125 members and guests at each.

Among out-of-town visitors present were *Richard Scott* of the *Udylite Corporation*, Detroit, Mich.; *Richard Lord* of the General Electric Company's San Francisco technical staff; and *Palmer H. Landon*, New York, assistant publisher, *Metal Finishing*.

Mr. Langdon, who was engaged on a transcontinental business tour for the magazine, timed his arrival in Southern California to permit his attendance at the Breakfast Club business sessions and annual banquet. He left for San Francisco the following day to attend the 5th Western Metal Congress and Exposition which was held in the Oakland Civic Auditorium, Oakland, Calif., March 22 to 27.

Dr. Glasstone was the first speaker at the Los Angeles conference after the presentation of a technicolor motion picture depicting the production and operation of plastic molding machines by the *F. J. Stoke's Machine Company* of Philadelphia.

Dr. Glasstone presented an extemporaneous talk on the principles of electrochemistry. In effect, he took his audience behind the scenes in a plating shop and lifted the veil on activities and processes which are invisible to the human eye. Initially, he described what electroplating consists of and defined in technical terms, elaborating with chalk drawings, what happens when cathode and anode are electrically charged in a solution tank and the effect which the set-up has on the articles to be plated when it is immersed in the liquid.

His presentation of the subject was along the lines of how positive and negative ions are developed in the solution and the invisible reaction which takes place when the ions of metal are attracted to the article to be plated and deposited thereon.

The electro-potential is determined by the amount of voltage to be applied, he said, and added that the potential depends upon two factors, the character of the metal and the number of ions. A question and answer period followed the close of the talk.

After a noon-day luncheon in the club, the educational session was re-

sumed at 2 p.m. Among those who addressed this session were *Richard Lord*, San Francisco, *General Electric Company* who presented a timely talk on rectifiers; *Elburn D. Marcum*, technical representative of the Electroplating Division of the *duPont Company*, El Monte, Calif., whose discussion on bright zinc was enthusiastically received. *M. H. Orbaugh*, supervisor of the electroforming department, *Bone Engineering and Tool Company*, Glendale, Calif., presented an equally meritorius talk on engineering electroforming. Electric controls for the plating industry was the subject of *Richard Scott* of the *Udylite Corporation*.

The branch's annual dinner dance was held in the spacious ballroom of the Breakfast Club from 7:30 to 11:30 p.m. Attendance was announced as approximately 325. Some 200 prizes contributed by members and manufacturing firms were distributed, with *Don M. Bedwell* serving as toastmaster for this part of the program. The most sought after prize, a beautiful bronze plated metal figurine of a horse, was won by *Mrs. Stanley Rynkofs*. One of the young ladies, who shrieked with glee when her number was called, marched up to the platform, only to find to her startled chagrin, that she had won a huge rubber-lined tank which stood nearly as high as she.

BRITISH INDUSTRIES FAIR

In May the British Industries Fair will be opened. This event has not taken place since before the war and from every standpoint great importance attaches to it. The Fair will be held in two parts, one for the Engineering and Hardware Trades at Birmingham, the other—covering all remaining fields—in London. Some 4,000 exhibitors from all over the Empire and a number of foreign countries will participate.

A number of important inventions and new processes will be displayed for the first time. The authorities are making strenuous efforts to make it the biggest-ever show in England. A large section of the Fair will be devoted to Textiles. There are also going to be important shows of electro-plate, scientific and optical goods, jewelry and fancy goods—to mention only some.

In London the main events will be at the huge Olympis Hall where almost 1,000 exhibitors will have their stands.

NATIONAL PLASTICS SHOW

An industrial exposition which is expected to be one of the largest post-war business shows so far in Chicago will begin May 6 when *The Society of the Plastics Industry, Inc.* opens its Second National Exposition at The Coliseum. The exposition will run through May 10.

This is entirely a trade show. Industrial, commercial and press representation will be heavy, but no bid will be made for public attendance. Admission will be by invitation cards which are being distributed to customers and prospective customers by exhibitor companies.

More than 135 exhibitors have already been assigned space for the show. The SPI, comprising over 600 firms, and having a total roster of 1600, with heavy Canadian, some English, Swedish and other foreign membership, will show the national and international plastics world to an industrial and business audience which, reservations indicate, will be attracted

from almost every phase of American enterprise—from buyers for small retail stores all the way through to large mail order houses and heavy industrial customers.

Breakdown of the exhibitors follows the line of the industry, with a heavy representation of molders, fabricators, materials manufacturers and machinery firms.

Varied technical sessions and trade association meetings will be held concurrently, at the Stevens Hotel where The SPI's annual convention will be going on. These will include a merchandising forum, scientific lectures, and special addresses.

Three main phases of the industry will be covered by the show: New products exhibits, dramatizing uses never dreamed of five years ago; Recent machinery developments for plastics production; and the latest fabricating techniques.

Heavily underscored throughout the show and convention will be the "almost 100 percent" plastics conversion to peacetime uses—the assault boat of Pacific campaigns is now your laminated luggage or canoe, anti-gas covers now shower curtains, radar castings house your radio set, and hundreds of other examples, some of them recently off "secret" lists and so far used only in highly technical applications.

The SPI expects that one of the major revelations of the show will be the technical advances which have been consolidated in all phases of industry in the past year, uses of plastics in plants of all sizes and types as insulators, housings, gears, floorings, wall panelings, electronic fittings and a thousand scientific applications. These are the "unseen" uses of plastics. Plastics engineers are proud of these applications and contrast them to the ordinary household and office plastics. The SPI points to these in their con-

stant campaign to "deglamorize" plastics, citing the fact that in the industrial field plastics have always been accepted, not as a substitute or a "gay" material, but as a vitally needed industrial tool suitable for adaptation and for operating in conjunction with older materials.

The extent to which plastics have been introduced with success in almost every field of human activity will be dramatized for the trade, to show graphically how the new, competitive elements of plastics literally accompany one from cradle to grave. In fact, the newest phase of the plastics industry—low-pressure molding—will exhibit its laminated cribs and baby buggies as well as its coffins, canoes, luggage and other "large, contoured shapes" as the technicians designate them. Low-pressure developments in the housing field will be shown, including wall panels, filler plastics mounted between sheets of aluminum or thin steel for prefabricated homes, utility units molded in a single section, kitchen counters and other new applications.

AMERICAN ZINC INSTITUTE

The Galvanizers Committee, which is sponsored by the *American Zinc Institute*, is to hold its seventeenth meeting in St. Louis, Mo., on April 28-29, 1947, according to *Chairman N. E. Cook*, of Wheeling Steel Corp.

F. G. White, technical director, *Granite City Steel Co.*, heads the program committee for the occasion, which will be held at the Hotel Statler coincidentally with the annual meeting of the American Zinc Institute.

ELECTRODEPOSITORS' TECHNICAL SOCIETY

A very interesting function was held by the *Electrodepositors' Technical Society* on Saturday, December 7th, at the Society's headquarters, the Northampton Polytechnic, London, England, when the twenty-first anniversary of the foundation of the E.T.S. was celebrated. A large number of members and many visitors were present at the Soirée which opened the proceedings, and considerable reminiscences of the early days of the Society took place during the excellent buffet tea which was provided.

Thereafter, the proceedings were continued in the main lecture theatre of the old Northampton building. *Dr. S. Wernick*, the president, was in the chair, and he was supported on the platform by *Mr. Samuel Field*, the Society's first president, and most of the past presidents, including in particular, *Dr. R. S. Hutton*, *Mr. E. A. Ollard*, *Dr. H. J. T. Ellingham*, *Mr. A. W. Hothersall* and *Dr. J. R. I. Hepburn*. Also present on the platform were *Dr. G. E. Gardam*, vice-president, *Mr. F. L. James*, honorary treasurer, and *Major L. H. Peter*, chief engineer for *Westinghouse Brake & Signal Co.*

A series of colored graphs and diagrams illustrating the growth of the Society had been erected on the wall

behind the platform, showing in graphic form the achievements during the Society's history, the steady growth of publications and membership, etc. Examples of some of the latest types of electrodeposits and electrolytic polishing, besides intricate instruments which have been developed in recent years for the control of electrodeposits, were exhibited on the bench before the gathering.

Obituary

Paul W. C. Strausser

The many friends of *Paul W. C. Strausser* all regret his passing away on January 26, 1947.

Mr. Strausser was with the *Chrysler Corporation* from 1925 until 1930 doing research work on new plating procedures, which are now standardized in the automobile industry. From

Paul W. Strausser

1930 until 1939 he was at the National Bureau of Standards as Research Associate of the *American Electroplaters' Society*. His work during this period served as the basis for several specifications for electroplated coatings.

After 1939, Mr. Strausser joined the *F. B. Stevens Co.*, where he not only continued his work in the laboratory, but became engaged in selling and contacting the trade.

At the time of his death, Mr. Strausser was 54 years old, most of which years were spent in the electroplating field.